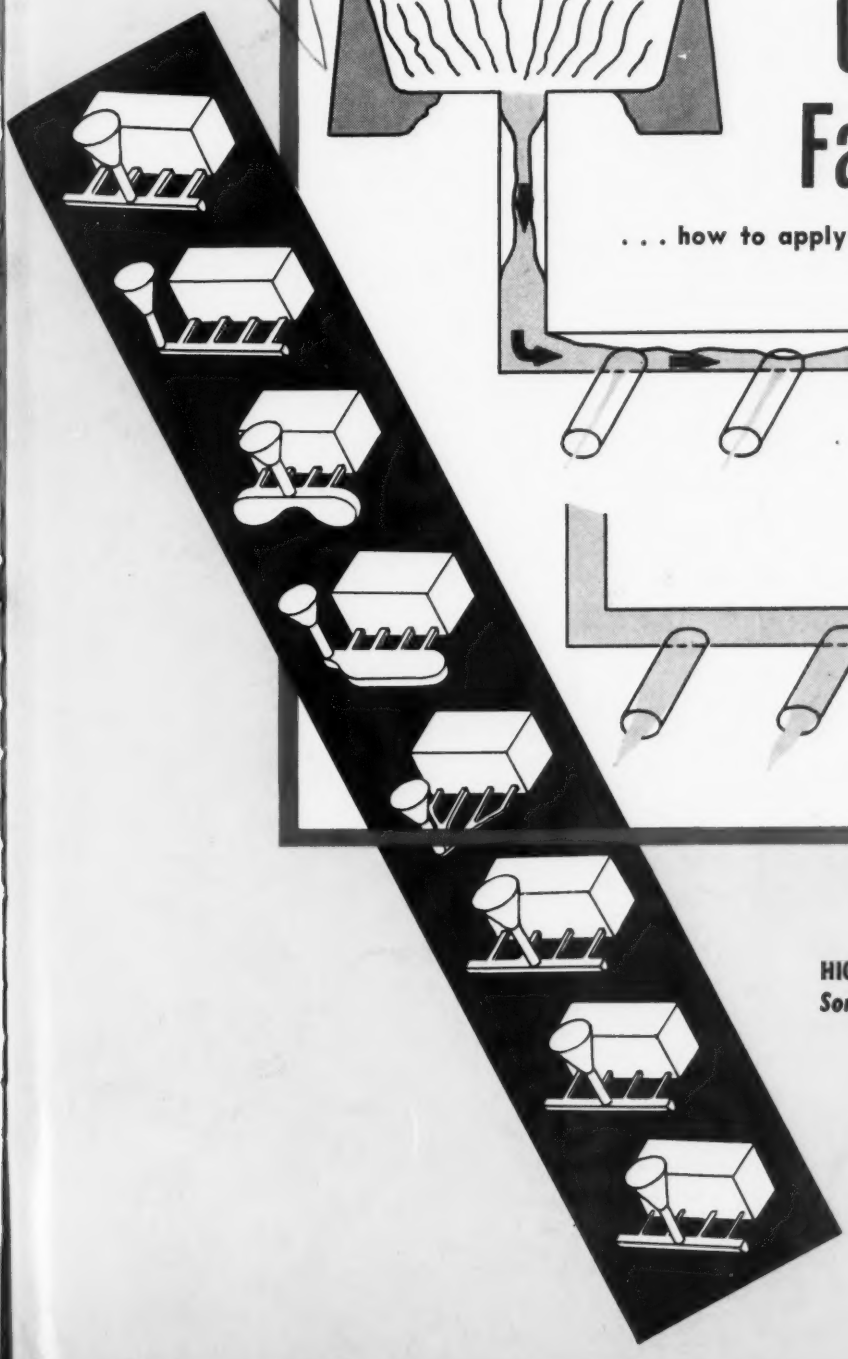
APRIL 1954

FOUNDRY

...WHEREVER METALS ARE CAST



Gating Factors

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FLAME HARDENING GRAY IRON
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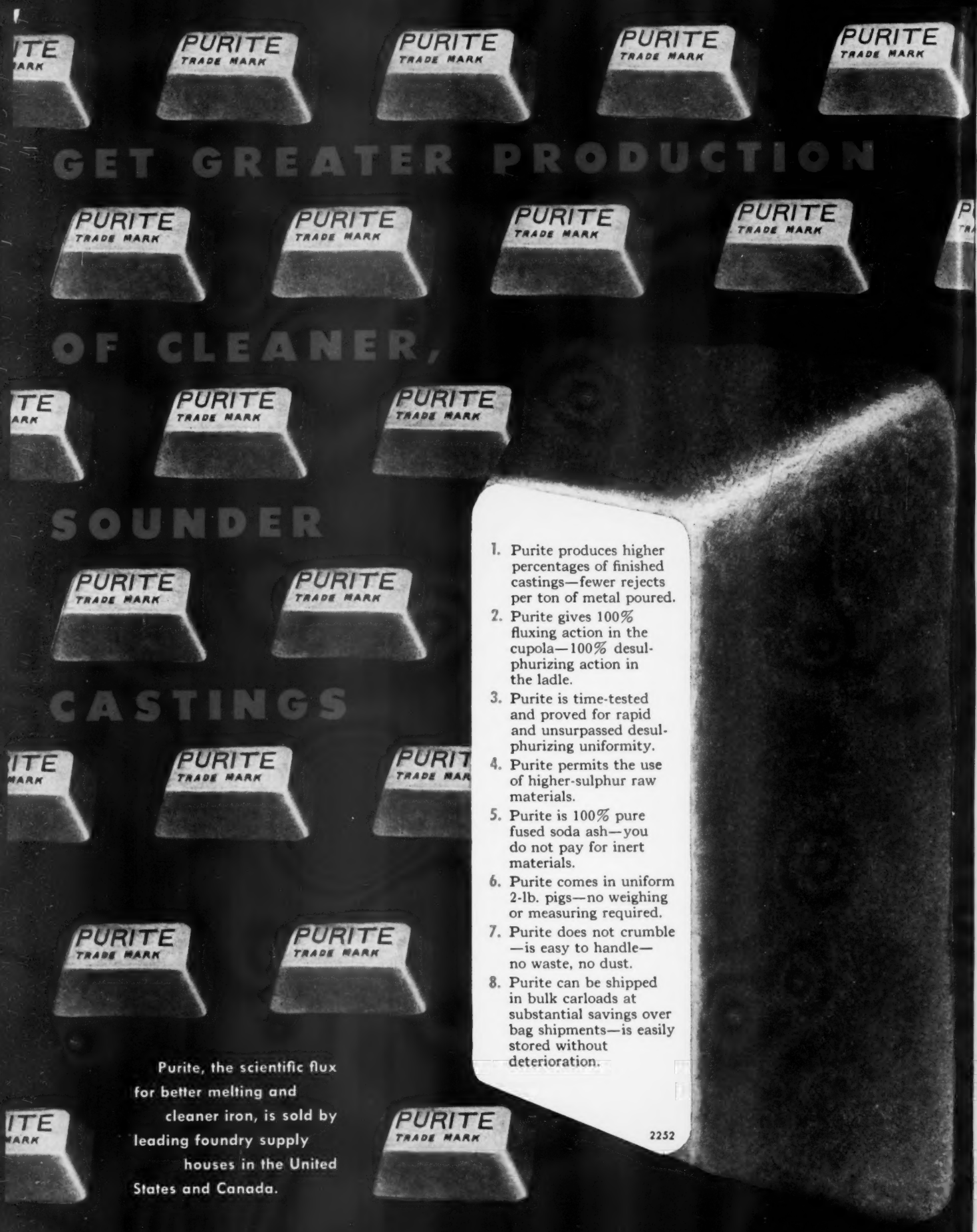
GET GREATER PRODUCTION OF CLEANER, SOUNDER CASTINGS



1. Purite produces higher percentages of finished castings—fewer rejects per ton of metal poured.
2. Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.
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4. Purite permits the use of higher-sulphur raw materials.
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6. Purite comes in uniform 2-lb. pigs—no weighing or measuring required.
7. Purite does not crumble—is easy to handle—no waste, no dust.
8. Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

2252

Purite, the scientific flux for better melting and cleaner iron, is sold by leading foundry supply houses in the United States and Canada.

MATHIESON

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Mathieson Industrial Chemicals Division
Baltimore 3, Maryland

The Ghost on MacGregor's Porch

...or how Chuck Wright solved a problem with teeth in it

"There wasn't a soul on MacGregor's porch, and yet his front door bell rang five different times within a quarter hour."

After delivering these words, Chuck Wright... the Inco Distributor foundry specialist... added, "You remember MacGregor who runs the foundry for Clybar Machine Co. That kind of guy is no chowder-head.

"Mac was sitting at home last Tuesday night, watching television. He thought kids were playin' a prank the first time he answered the bell and found nobody at the door.

"But after the fourth time... and nobody there... he decided to investigate.

"Mac no sooner stepped on the porch when the ringing started again. Conscious of costs, he rushed to the basement and disconnected his batteries. The ringing stopped, but Mac knew he faced a problem. An electrical problem.

"He *knew* what to do with a casting problem, but this electrical problem had him stopped. For instance, when Clybar added road building machinery to their line, they used a mix of about 2.00% silicon content to run such castings as lifting gears, tilting gears, scarifier cylinders and the like. This mix showed porosity in the heavier sections of cylinders, and open grain at the base of machined teeth.

"That's when Mac first wired me. He needed stronger, more uniform, closer grained iron... readily machinable and free from porosity in the heavy sections of parts having a light and heavy section tie-up.

"For sections varying from 3/8" to 2", he ran my suggested charge of 35% steel scrap, 30% pig, 35% returns and purchased scrap... adding nickel to come out with a composition analyzing 1.65% to 1.75% silicon, 3.15% to 3.25% total carbon, 1.25% nickel and 0.60% to 0.80% manganese. Phosphorus under 0.30% and sulfur under 0.12%.

"As a result, Mac reduced his losses to less than 3%. Shrinkage disappeared from junctions of heavy and light sections, and a very nice finish came from machining at regular speeds.

"Since a foundry specialist answered his casting problem, the Scotchman asked an electrician for an answer to his bell problem.

"I won't repeat what Mac said later ...about mice with an appetite for wire insulation... but anybody needing help with a casting problem is invited to drop me a line."

Chuck Wright

INCO

The International Nickel Company, Inc.

67 Wall Street New York 5, N. Y.

ATTENTION

"GOOD HOUSEKEEPERS"

DUSTLESS SEACOAL

AND PITCH BINDERS

FEDERAL now offers "DUSTLESS" seacoal and pitch binders as a contribution to the movement toward "better housekeeping" in foundries. Chemically treated to minimize dustiness in handling, these sand additives will help provide more healthful working conditions—by substantially reducing skin irritation and dust inhalation. There's economy in FEDERAL "dustless" products, too, despite a slightly higher cost. In addition to the benefits from "better housekeeping", their use holds to an absolute minimum the usual dust-losses in air-swept mixing and handling equipment.

FEDERAL's "dustless" treatment does *not* involve the addition of "wetting agents" that can have detrimental effects on sand mixtures. FEDERAL's is a *chemical* treatment that in no way affects the performance of sand additives.

FEDERAL will continue to stock "regular" seacoal and pitch binders, along with the "dustless" type. But, we strongly urge you to switch to, or at least investigate, our new "dustless" products.

Ask your FEDERAL representative to demonstrate the new "dustless" additives. He'll use two jars of seacoal—one containing "regular" seacoal, the other "dustless" seacoal. When shaken vigorously, and the cap removed, the jar of "regular" gives off clouds of dust. But, *no dust* arises from the jar of "dustless", when it is subjected to the same agitation.

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FOUNDRY

Volume 82—Number 4

APRIL 1954

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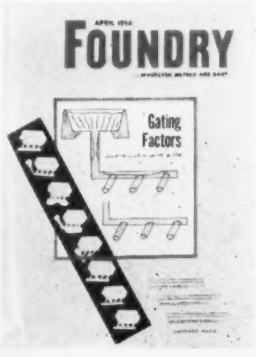

THE COVER: Results of gating system studies conducted at the Naval Research Laboratory are summarized in our story on gating factors, which begins on page 102

Published monthly by the Penton Publishing Co., Penton Building, Cleveland 13, O. Subscriptions in the United States, possessions and Canada, one year $5; two years $8. Other foreign countries, one year $10. Single copies 75 cents. Copies published three or more months previous to date of current issue $1. Entered as second class matter at the postoffice, Cleveland, O., under the act of Mar. 3, 1879.

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Gigantic casting by Lynchburg Foundry Co.

Moving out of Radford, Va., on its way to Baldwin-Lima-Hamilton Corporation is one of the largest castings in current production at the Radford Plant of the famous Lynchburg Foundry Company.

Weighing 26 tons and measuring 9 ft. x 6½ ft. x 17 ft., this block of cast iron will go into service as an upright for a huge press.

The cores used in producing this casting tip the scales at 35 tons! When you estimate the time, manpower, and materials involved, you can imagine the responsibility placed upon the core department.

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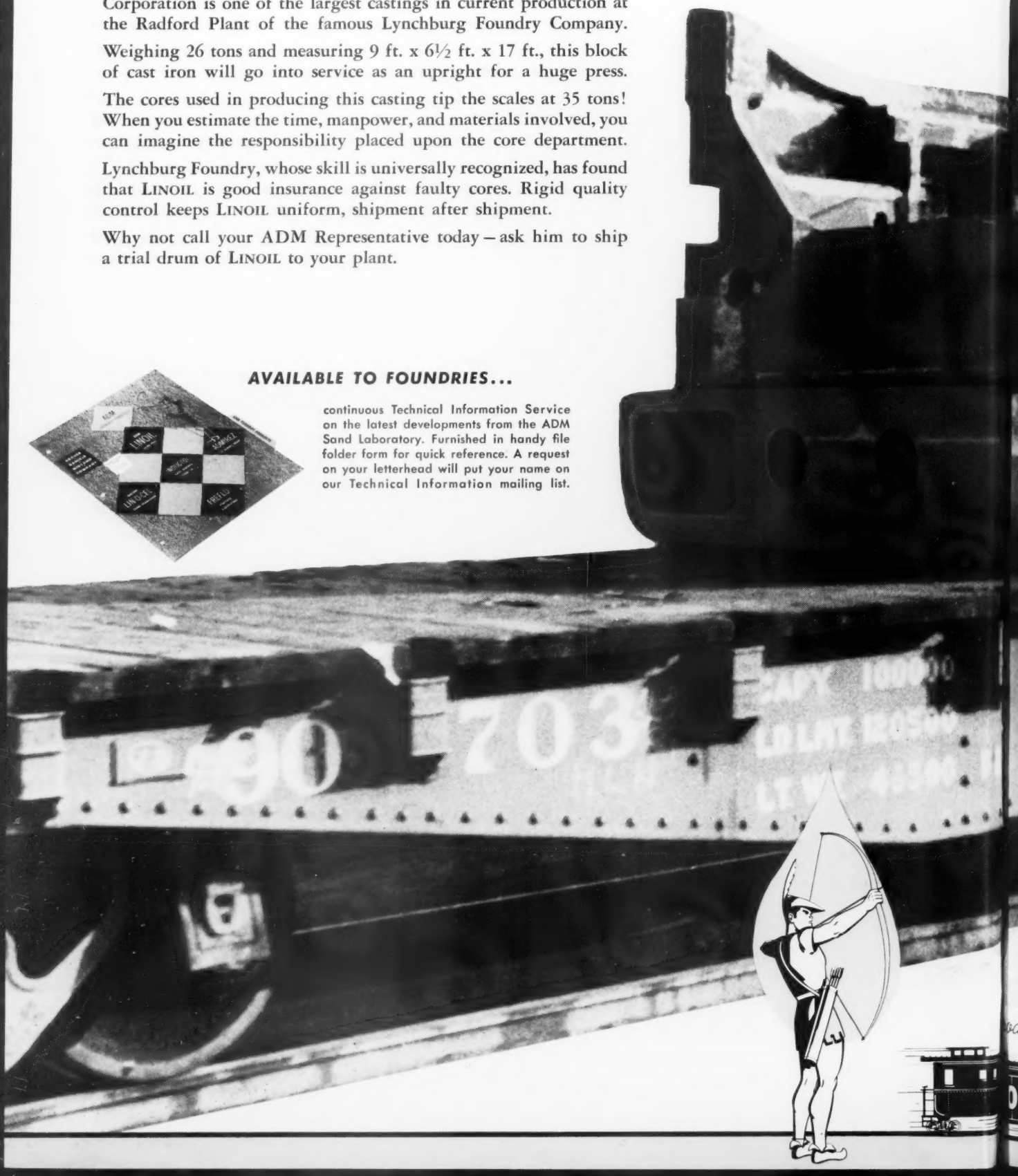
continuous Technical Information Service on the latest developments from the ADM Sand Laboratory. Furnished in handy file folder form for quick reference. A request on your letterhead will put your name on our Technical Information mailing list.



...Co. takes 118 gallons of

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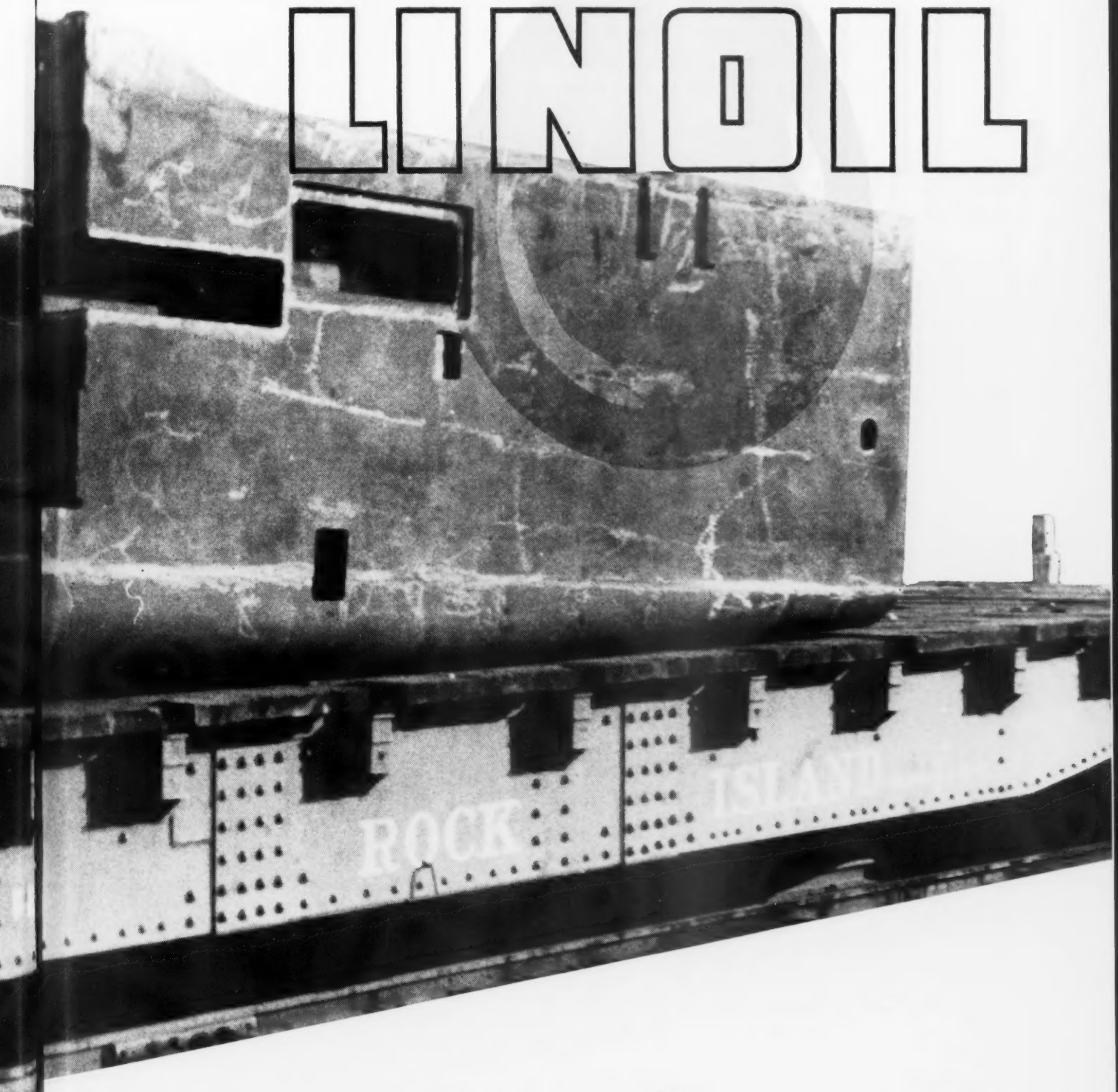

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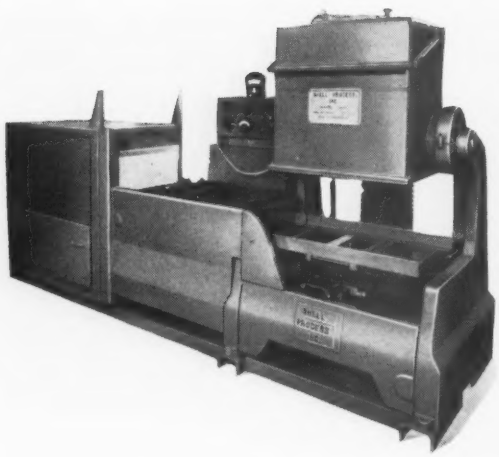

This is the most effective team you can have for the rapid production of shell molds. One minute from Shell Molding Machine to perfectly bonded shell ready for horizontal, vertical or diagonal pouring with little or no back-up problems.

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Imperial did . . . on this elevator handling hot sand

The real test of satisfactory belting performance comes when the plant operator orders a replacement for an original belt. When this elevator was installed at the Allegheny Ludlum Steel Corporation, Buffalo, N. Y., the conveyor company equipped it with an Imperial Standard Sahara (150′ x 12″ x 7 ply). For 4½ years that belt operated 16 hours a day elevating hot shakeout sand.

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Imperial Sahara Belts are made of heavy-duty hard silver duck, double stitched to positively prevent ply separation. Special impregnation gives protection from the destructive action of sustained high temperatures. Manufactured in three types: Standard Sahara for temperatures to 300° F.; Insulated Sahara, up to 450°; Super Insulated Sahara, up to 600°. Let us make money-saving recommendations on your conveying or elevating jobs.

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Engineered Belting— The Right Belt for Each Job

With the Editors

WE GOT HIT: It was the last of February and the folks in Cleveland, our old home town, were commenting about the mild winter. While the weather man had told us that it had been a bit colder than normal in January, the almost total absence of snow, ice and high winds left the distinct impression that this had been one of the better winter seasons along the shores of Lake Erie. As the month came to a close, there was a smell of spring in the air, the robins were beginning to arrive and the time for fishing did not seem far away.

And then it happened. March came in like a lion. It growled and snarled for a solid week. We had blizzards, about 21 inches of snow on the level, and very little of the terrain seemed level. Cleveland was just about paralyzed from Monday morning until Friday, with most business at a standstill. But not the business of preparing this issue for you. Most of the editors made it from home to the office every day, although it required from one to three hours for a one-way trip. Finishing touches were completed on the issue, and now all that remains is the mechanical details of dummying, making up the type in page form, reading the proofs, making the corrections, printing, folding, binding and mailing. Just a few more details, you see, and you have your April issue.

—o—

FOUNDRY on Cover: Logan Co., Louisville, Ky., has announced a new "X-Series Bearing" with a folder which has a cover illustrating seven magazines in which these bearings are being advertised. You guessed it —for of course FOUNDRY is there along with our sister publications STEEL and NEW EQUIPMENT DIGEST. Thanks to W. Hume Logan for this fine publicity.

—o—

Honored: Ajax Flexible Coupling Co., Westfield, N. Y., recently honored two men who have been connected with the company for over 25 years. Arthur E. Jones, president, Arthur E. Jones Co., representatives of Ajax in the central and western New York territory, and Wayne Belden, vice president of Ajax, were presented with wrist watches by William T. Welch, president and chairman of the board. One of the interesting highlights of the affair was a presentation of a framed enlargement of an early Ajax advertisement headlining Mr. Jones as the "Ajax Man in Upper New York State." Congratulations to Messrs. Jones and Belden.

—o—

Make It Simple: With the growing emphasis on automation, we rather liked the following from a talk by Otto Svoboda, E. W. Buschman Co., Cincinnati, before the ASME:

> One of the most important requirements for automation is to design the simplest combination of mechanisms and controls possible. Very often we do it the hard way first.
>
> If a simple electric controller or limit switch will do it, don't insist on electronics. If the movement can be accomplished by a simple lever arm mechanism, don't use hydraulic, air or electric energy. Remember, each additional moving part, in any equipment, adds cost, maintenance and service.
>
> In some applications of automation, electronic equipment may be the only type that will produce the action or results desired, and it should be used. Do not mount electronic equipment where it may be subjected to excessive vibration or to severe atmospheric conditions, because plants do not have men in the electrical maintenance departments completely versed in servicing electronic equipment."

Mr. Svoboda believes that such progress in automation will come from conveyor engineers developing new ways of automatically moving materials and positioning them for processing.

—o—

Danger—Keep Away: We recently received a request for a reprint of an article, "Internal *Ferocity* and Inverse Segregation in White Cast Iron," presented in the June, 1953, issue.

—o—

Looking to May: With this issue out of the way, work is progressing on the next big job, the May preconvention number. The editors believe the material now being assembled for presentation in that issue will prove exceptionally interesting to the foundry industry.

Of course, the AFS convention will be one of the features, with detailed information on the various activities of convention week, the technical program, the exhibition of foundry equipment and supplies, the plans of the Northeastern Ohio Chapter for special entertainment such as plant visitation, and the announcement of AFS medalists and life members. These features will give readers an insight in what may be seen at Cleve-

(*Concluded on page* 12)

MILLIONS of CASTINGS
prove that Harbison-Walker Refractory
STRAINER CORES —*make better castings* —*reduce foundry costs*

7 Standard Sizes

Equivalent gate diameters ranging from ⅝-inch to 1½-inch. Packed in sturdy, handy cartons for molding room use. Note the clean lines and edges.

The marked swing to refractory strainer cores spotlights Harbison-Walker's extensive experience and important accomplishment in this field. Many millions of Harbison-Walker Refractory Strainer Cores are used in widely diversified foundries. The knowledge gained through the service of these strainer cores has guided Harbison-Walker engineers in the development of cores that meet every requirement.

Harbison-Walker Refractory Strainer Cores easily withstand the heat and weight of the molten metal during pouring, the initial heat shock and the erosive effect of fast flowing metal.

Harbison-Walker Strainer Cores are made of highly refractory ceramic material, formed under pressure and fired at high temperatures. They keep castings free of slag, oxides and other impurities, reduce reject losses and materially cut operating costs.

HARBISON-WALKER PRODUCTS will be shown at the Foundry Exhibit May 8 to 14, Booth 128

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World's Largest Producer of Refractories
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Pittsburgh 22, Pennsylvania

Please send samples of Strainer Cores ..... inch equivalent gate diameter, and a copy of your descriptive folder to:

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Company_____

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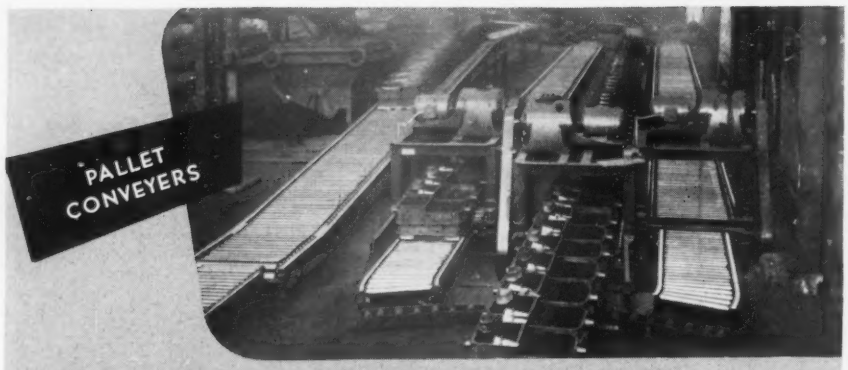

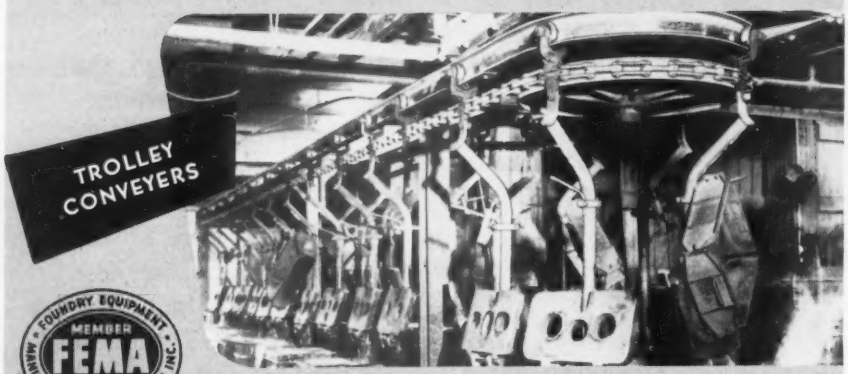

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Engineering Offices or Sales Agencies in Principal American and Canadian Cities

(*Concluded from page* 10)

land, May 10 to 14.

In 1953 the pre-convention issue of FOUNDRY presented a number of special articles by leading authorities in the field which outlined the technical progress in the production of the various types of ferrous and nonferrous castings. To follow up this report on the industry, the 1954 preconvention issue will discuss developments in equipment and machines utilized in castings production, with a look to possible trends in the mechanization and modernization of foundries.

The editors have received two special articles which now are being prepared for publication. William E. Daugherty, consulting engineer, Giffels & Vallet Inc., Detroit, has taken an interesting look at the future possibilities of automatic machinery in the production of castings in an article, "Automation in the Foundry." Lester B. Knight, Lester B. Knight & Associates Inc., Chicago, has discussed in detail the need for modernization and mechanization by foundries to meet growing competition. Foundrymen will find that both of these special studies present a challenge to their thinking on production procedures of the future.

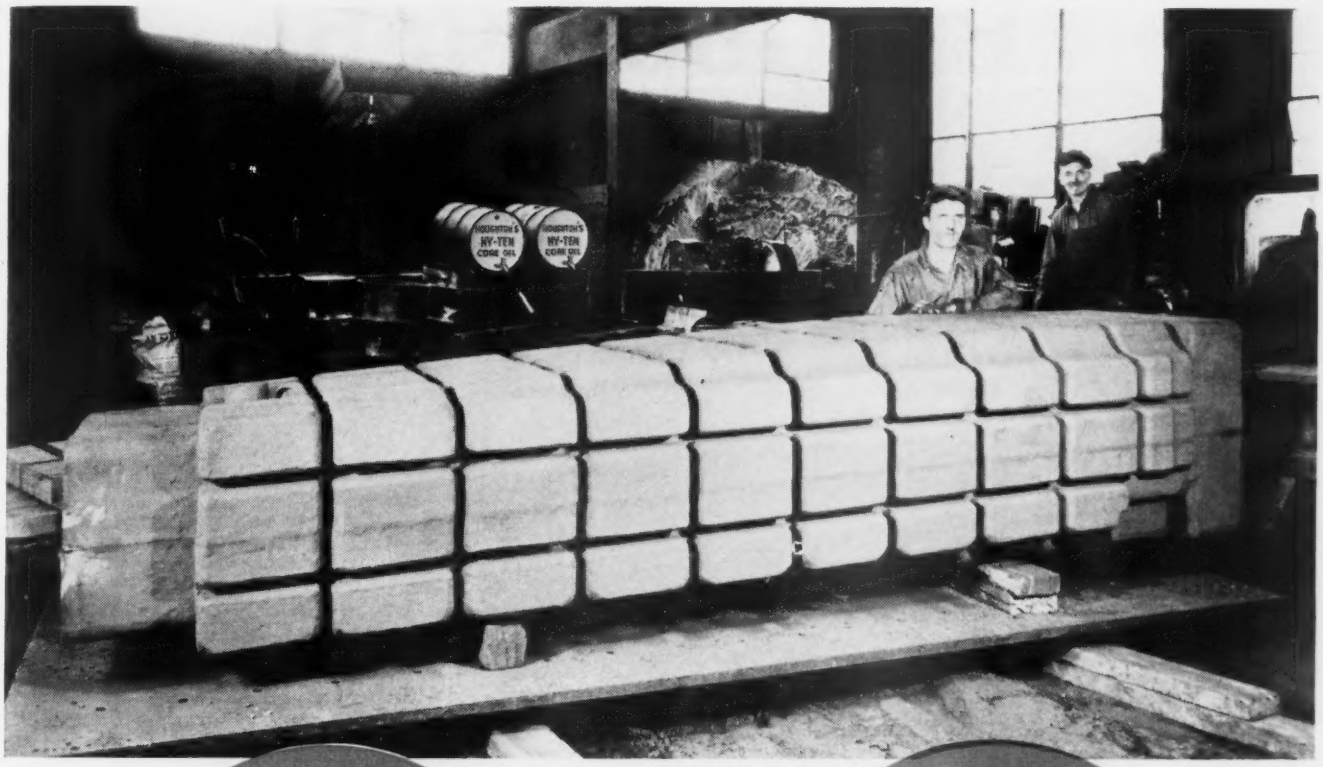
Some foundrymen believe the small shop has been somewhat neglected in the way of machines designed for that type of production. Believing that a wide range of machines are now available for small foundries, the editors secured the co-operation of many equipment manufacturers in supplying information on their particular contributions to the small foundry. Bob Herrmann and Jack Miske are busy assembling data and photographs on well over 100 different pieces of equipment, and this review will be presented in May.

As we move into the period of more active competition for castings orders, the industry naturally is interested in its facilities, age of the equipment and plans for the future.

FOUNDRY has had the active help of a large cross section of the industry, and Dave Gibbs and George Auner and the other members in the Market Research and Promotion department have spent hours in collecting and tabulating these data. Now Bill Gude is studying the results, and shortly Don Cadot and others in the art department will begin the preparation of charts for this extensive study.

Beyond this, the issue will present the regular departments.

Quite an undertaking, don't you think? F.G.S.



Core for this 9600-lb. boring machine casting is 14' x 48" x 42", weighs 5000 lbs. Made without chaplets, center filler of coke. Hy-Ten Core Oil used.

INCREASE YOUR SOUND CASTING YIELD...

WITH HOUGHTON HY-TEN CORE OIL SERVICE

Profits from a foundry operation depend on the yield of sound, true-to-pattern castings. To get good castings requires cores that can "take it". Cores that have sufficient green strength, that bake out thoroughly without overbaking, cores that do not "gas", that have adequate tensile strength, yet shake out cleanly and easily. And all these qualities are largely dependent on the performance of the core oil.

To get the best in core oil performance, call the Houghton Man. Ask him to tell you and show you how the controlled, catalytic, co-polymerization of Hy-Ten Core Oils assure you the best in core oil performance. You'll be interested, and it will prove profitable. Or, if more convenient, write E. F. Houghton & Co., 303 W. Lehigh Avenue, Philadelphia 33, Pa.

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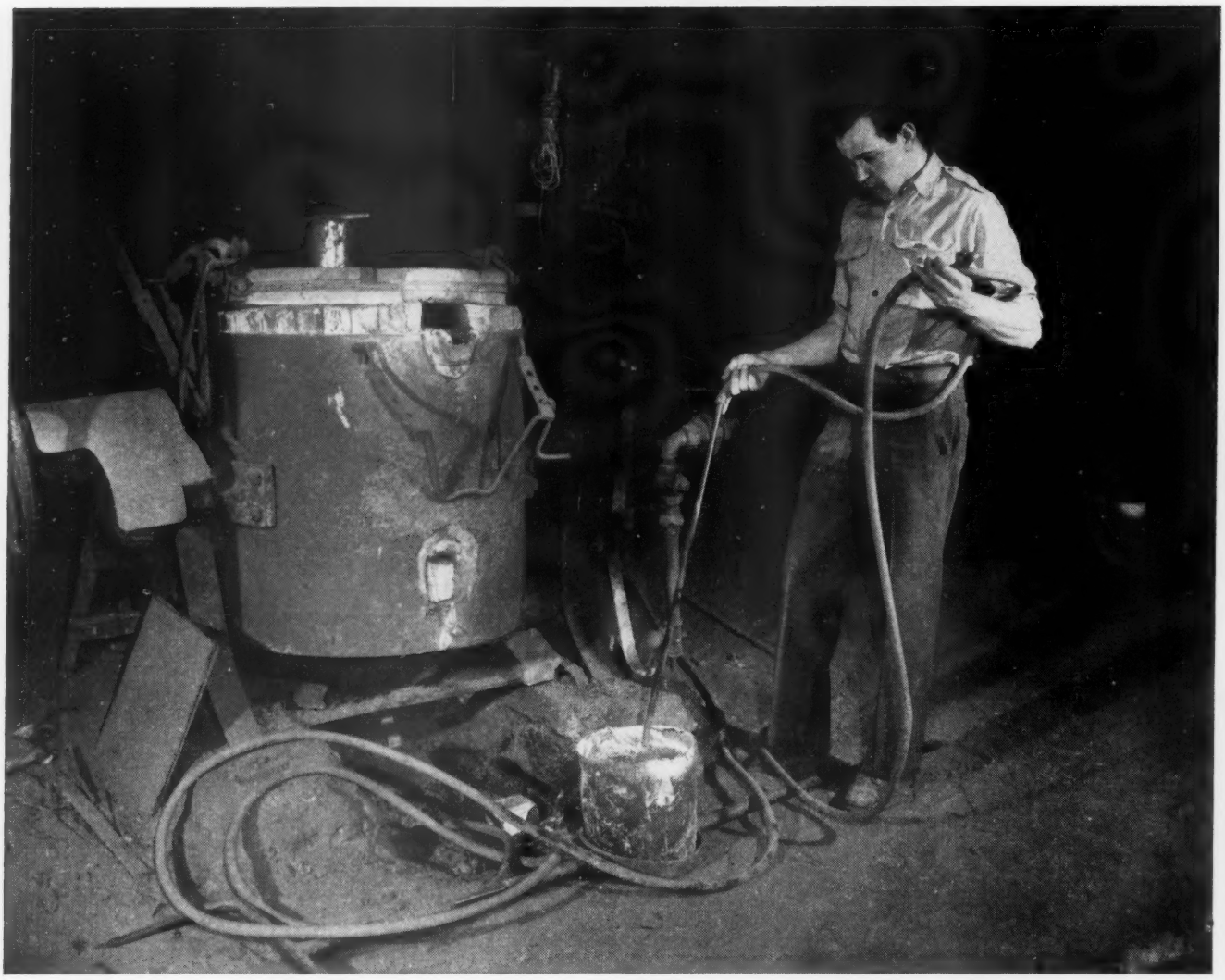
Ready to give you on-the-job service . . .

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



This B. F. Goodrich hose still good after 25 years' use

B. F. Goodrich Type 50 handles 85% of all air hose jobs

THAT length of hose in the picture started out life handling air under pressure. Here it's being used with gas to heat a ladle. It has taken heat and pressure, been dragged over rough floors and been squashed. Abuse that usually shortens hose life, yet this rugged B. F. Goodrich hose is still at work after 25 years!

No wonder so many foundries have switched to B. F. Goodrich Type 50 hose to solve their hose problems. And here's why:

Rough treatment won't tear it

In foundry service, air hose is often dragged over rough surfaces. The cover of B. F. Goodrich Type 50 is abrasion-resisting. Scraping over rough, gritty floors won't tear it. Type 50 is stronger, too. A layer of rubber is sandwiched between each ply of cord reinforcement. This cushions the cords against impact. Moisture can't get to the cords to cause damaging mildew.

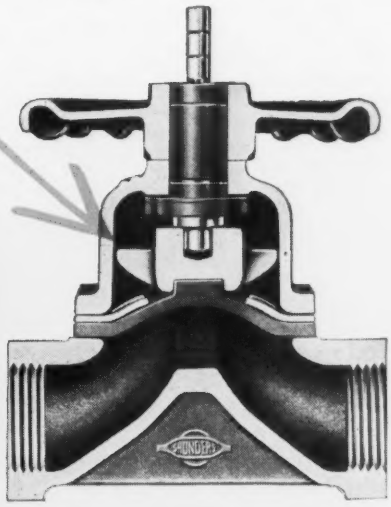
Oil won't rot it

The inside lining of Type 50 air hose is made of an improved rubber compound. Withstands heated air even when it contains lubricating oil. Will not break into loose, gummy particles that clog tools. The cover is oilproof. Handling it with oily gloves won't harm it.

Next time you need air hose, ask your B. F. Goodrich distributor about Type 50. Chances are it'll be the right hose for your job because it handles 85% of all air hose needs. And while you're at it, let him show you why BFG Grommet V belts last 20 to 50% longer, and find out more about recent improvements made in hot material conveyor belts. *The B. F. Goodrich Company, Dept. M-199, Akron 18, Ohio*

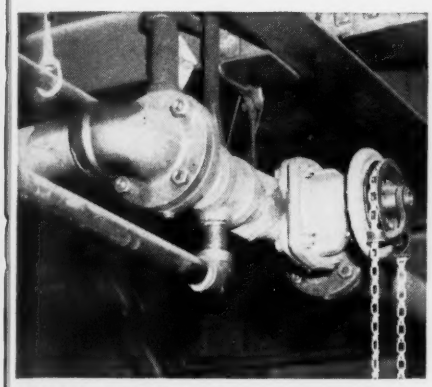
B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

THE IDEAL VALVE FOR FOUNDRY USE

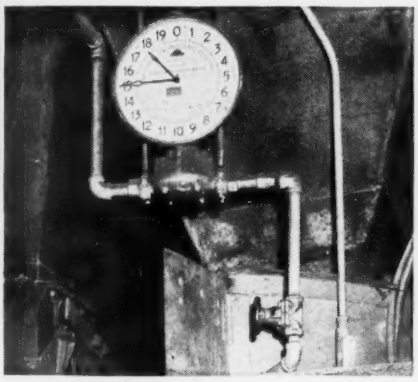


unexcelled for

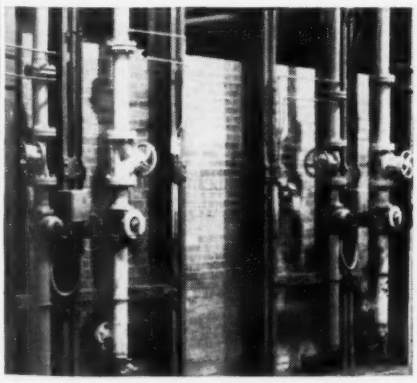
AIR...
WATER...
GAS!



COMPRESSED AIR — Chain wheel operated Grinnell-Saunders Diaphragm Valve on an elevated main air line to molding stations.



WATER — Grinnell-Saunders Diaphragm Valve on precision water metering line to molding sand muller in foundry.



GAS — Grinnell-Saunders Diaphragm Valves handling producer gas for annealing furnaces.

GRINNELL-SAUNDERS DIAPHRAGM VALVES

Credit the flexible, easy-to-replace diaphragm with providing important advantages. The diaphragm lifts high for streamlined passage, in either direction; closes tightly for an absolute seal, even when scale lodges on the valve weir.

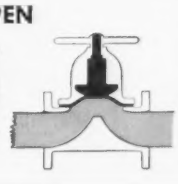
That feature alone can mean impressive savings. For a *single* leak in a valve on an air line, even as tiny as 1/32-inch, can waste in one month's time, the equivalent of the cost of a new Grinnell-Saunders Diaphragm Valve.

Grinnell-Saunders Diaphragm Valves offer other advantages, too. Bodies, linings, and diaphragm materials are available to meet most service conditions. The only part that ever needs replacing is the diaphragm, which can be changed in minutes without removing the valve body from the line. In downtime and overtime saved — in maintenance and repair work avoided — you are dollars ahead when you rely on Grinnell-Saunders Valves.

Grinnell-Saunders Diaphragm Valves, packed in cartons, are stocked by Grinnell branch warehouses and distributors from coast to coast. Write for Grinnell-Saunders Diaphragm Valve catalog.

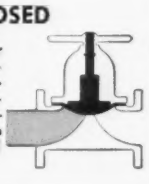
OPEN

No packing glands to demand attention. Working parts are isolated from fluid . . . sticking, clogging, contamination, corrosion eliminated.



CLOSED

Compressor or finger plate supports the diaphragm in all positions. No metal-to-metal seats to become damaged or wire-drawn.



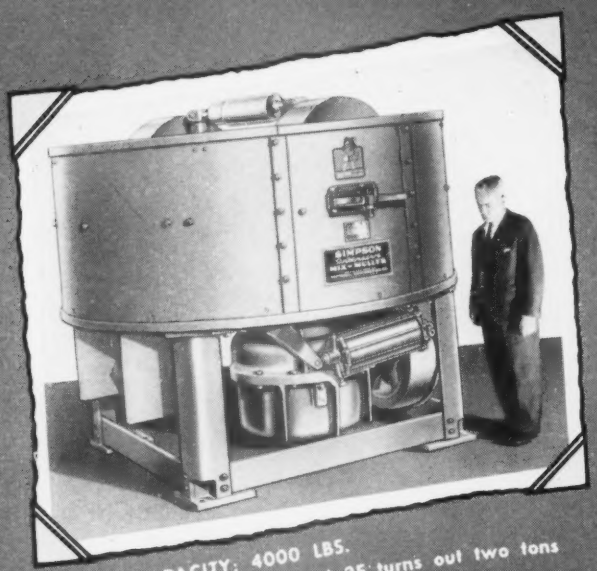
GRINNELL

WHENEVER PIPING IS INVOLVED

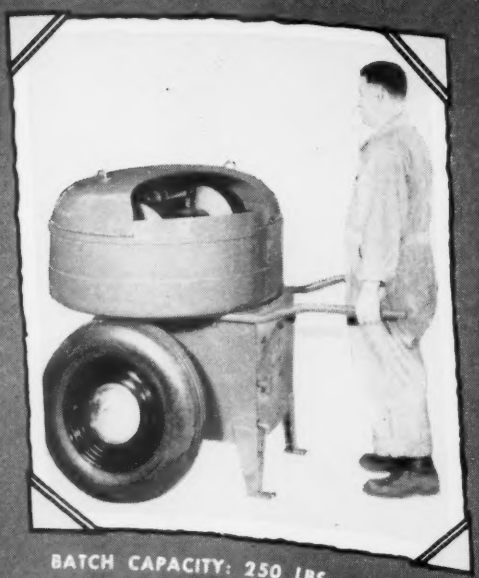
Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

In every capacity range

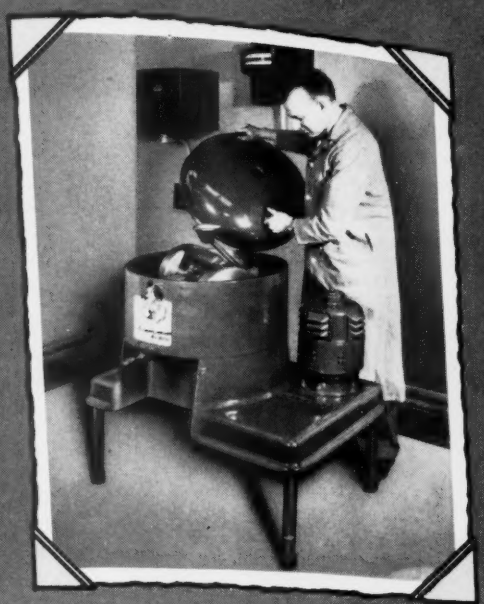


BATCH CAPACITY: 4000 LBS.
Three years in use—rugged 3F turns out two tons per batch, ideal for big sand systems.



BATCH CAPACITY: 250 LBS.
Popular Porto-Muller does big jobs in smaller foundries, quality jobs wherever metal is cast.

BATCH CAPACITY: 2000 LBS.
For any sand requirement or type of installation—versatile 2F has become "work horse" of the industry.



CAPACITY: 50 LBS.
Designed to meet a definite need. Here's real comparative mulling for the sand laboratory.

a New Generation of Simpson MIX-MULLERS

No. 1½ Model F coming.... See it at Cleveland in May

58TH FOUNDRY CONGRESS

BATCH CAPACITY: 1000 LBS.

CAPACITY: 500 LBS.
Compact new 1 Model F has integral crib scraper, V-Belt Drive. Best modern mulling equipment for medium-size batches.

National Engineering Company
(Not Inc.)
646 Machinery Hall Building
CHICAGO, ILLINOIS

New F series offers
more mulling for your money
...in a complete range of capacities

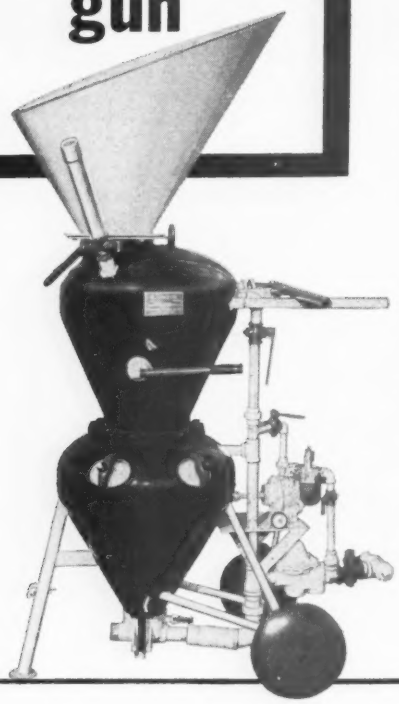
Here are the newest members of a familiar foundry equipment family. Around them, National Engineering Company has built a modern, purposeful new concept of sand preparation ... keyed to foundry industry progress.

Each of these new Simpson Mix-Mullers has been tested and thoroughly proven in actual foundry operation. Every one was designed to provide the ultimate in control over increasingly complex and more citical sand practices. Every design and operating improvement -- Spring loaded mullers, V-Belt Drive, centralized lubrication -- was conceived and incorporated to minimize operating and maintenance costs, yet afford maximum output ... per operating dollar ... per investment dollar.

Make modern Simpson mulling a partner in your plans for improved molding practices. A National Engineer can arrange for you to see the new Mix-Muller at work ... talk with satisfied operators. Over 7000 Simpsons, 800 of them of the F-type, are in use in leading foundries throughout the world.

National Engineering Company

The Blastcrete gun



Foundries across the nation are switching to BLASTCRETE, the most economical gun on the market

SIMPLE TO OPERATE AND MAINTAIN. Total crew 2 men. No special skill or training required. Easy access to feed mechanism for inspection. Rate of material flow easily adjusted while machine is in operation. *Versatile.* Handles all refractory materials, acid and basic—light and heavy. The outstanding feature of the Blastcrete gun is its steady and positive flow of materials, even materials of high moisture content. The Blastcrete gun is guaranteed to shoot a denser, more uniform patch. Eliminates dust conditions. All rebound immediately reusable.

Be sure you buy the Gun that is ASME coded

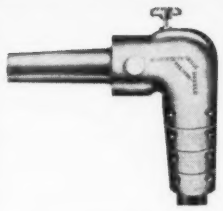
Check your present gun—see if it bears the ASME (American Society of Mechanical Engineers) seal.

Your state may be one of the many that require it. BE SAFE, the Blastcrete gun is constructed to meet ASME code requirements and meets all insurance requirements on pressure vessels.

Partial List of Blastcrete Users:

Albany Car Wheel Company
Albany, N.Y.
American Brake Shoe Company
Pomona, Calif.
The American Laundry Machinery Co.
Rochester, N.Y.
Axelson Manufacturing Co.
Los Angeles, Calif.
Bell Foundry Company
South Gate, Calif.
The Campbell-Hausfeld Co.
Harrison, Ohio
Canadian Refractories Co.
Montreal, Quebec
Compton Foundry
Compton, Calif.
The Davis Fire Brick Company
Oak Hill, Ohio
Dayton Foundry
Hollydale, Calif.
Duquesne Light Company
Pittsburgh, Pennsylvania
The Eastern Malleable Iron Co.
Wilmington, Delaware
Fraters Valve and Fitting Co.
Los Angeles, Calif.
General Metals Corporation
Los Angeles, Calif.
Great Lakes Founders & Machine Corp.
Ludington, Michigan
Gregg Iron Foundry
El Monte, Calif.
Howell Foundry
Los Nietos, Calif.
Interstate Foundry Company
Indianapolis, Indiana
Jones & Laughlin Steel Corporation
Pittsburgh, Pa.
Lake Erie Foundry Co.
Buffalo, N.Y.
McDonough Street Foundry
Joliet, Illinois
The Newnam Foundry Company, Inc.
Kendallville, Indiana
New Process Gear Works
Auburn, N.Y.
Patch-Wegner Company, Inc.
Rutland, Vermont
Phoenix Iron Works
Oakland, Calif.
Rich Manufacturing Company
Los Angeles, Calif. & Portland, Oregon
Sacks-Barlow Foundries, Inc.
Newark, N.J.
Sibley Machine and Foundry Corporation
South Bend, Indiana
Vulcan Mold & Iron Company
Lansing, Ill.

FREE TRIAL—Any Blastcrete equipment will be installed on 15 day free trial without obligation. Write for further information to your nearest Harbison-Walker Refractories Company or:



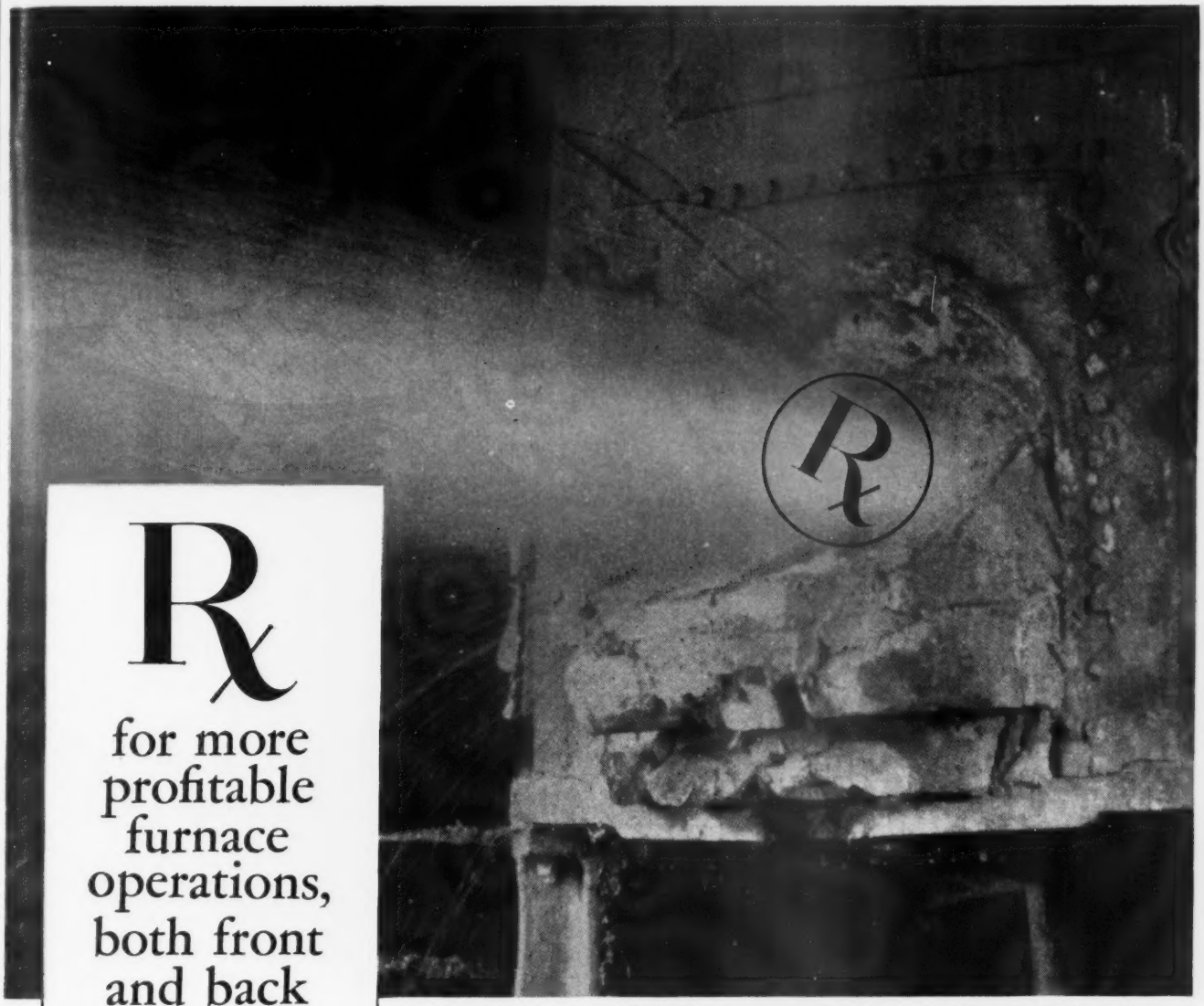
BLASTCRETE ANGLE NOZZLE

For shooting refractory linings in cupolas (largest to smallest) reverberatories, converters, electrics, and boilers. Also used for ladles, spouts, breasts. This nozzle will improve your present gun.

Be sure to visit our exhibit at the annual Foundry Convention, Cleveland, May 8 to 14.

Exhibit Booth #124

BLASTCRETE Service Company
11154 Santa Monica Blvd., Los Angeles 25, California



Rx

for more profitable furnace operations, both front and back slagging . . .

You can maintain hot metal schedules for your casting line and avoid costly shutdowns by using Norton *engineered and prescribed* CRYSTOLON refractories — slag hole blocks for back slagging cupolas, bricks and cement for front slagging cupolas.

Norton CRYSTOLON* refractories

If too much cupola down-time is slowing your metal-melting operation and cutting your profits, here's a Norton Rx to solve your problem:

Standardize on CRYSTOLON refractories — *engineered* for highest efficiency in the handling of neutral and acid cupola slags.

For back slagging cupola the Rx is CRYSTOLON slag hole blocks. For capping the notch and lining the slag chute in front slagging cupolas it's CRYSTOLON bricks and cement.

Wherever you use it, this top-quality refractory material will stand up under temperatures up to 3050°F without softening, spalling or cracking. Its extreme density assures exceptional resistance to slag penetration and chemical attacks — and it has 5 to 15 times the resistance of ordinary fire clay to erosion and corrosion.

In your own production, these advantages mean more continuous, more trouble-free furnace operations, at lower cost. CRYSTOLON bricks and blocks are made in sizes and shapes to meet every foundry requirement. For complete facts, see your Norton Representative. Or write to NORTON COMPANY, 303 New Bond St., Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto 5, Ontario.

NORTON

REFRACTORIES

Engineered . . . Rx . . . Prescribed

Making better products . . . to make other products better

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

Foundrymen are particular!

but— they're cost conscious, too!

that's why they choose

SULTRON® FLUX

With any cupola flux you expect to get a cleaner cupola, reduced bridging and improved melting conditions. With SULTRON you get these extra dividends:

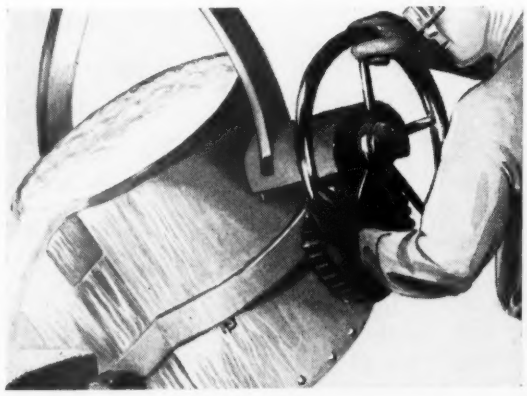
1. Higher metal fluidity
2. Improved machinability

This is conclusively proved in tests made by the department of mining and metallurgy of a leading university.

No other flux tested showed equal improvement in these properties. No wonder more and more foundries are turning to SULTRON for fluxing and desulfurizing!

Sultron is sold to the foundry industry only by the American Silica Sand Company and its coast-to-coast representatives.

Write for the address of the nearest coast-to-coast representative and warehouse—or take advantage of the free technical service. Traveling foundry technicians will help you with your fluxing problems without obligation.



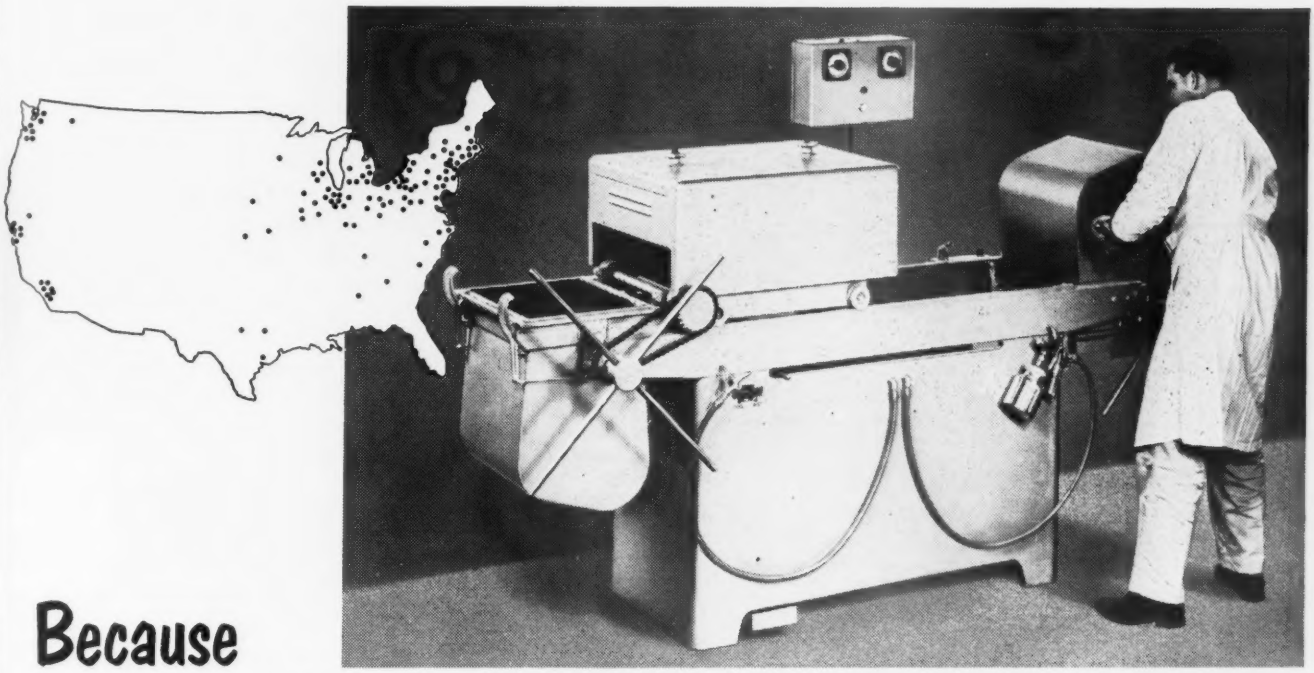
If you want clean fluid metal with controlled sulfur content, you should try Sultron in your melting process.

American Silica Sand Co.
OTTAWA, ILL.

Suppliers of: Crude and dried crude silica sand • SULTRON® flux • Australian zircon sand • Zircon flour

®SULTRON is the trademark of Westvaco Chemical Division, Food Machinery and Chemical Corporation, for its brand of sodium sesquicarbonate.

Why are more foundries earning more profits with SHALCO Shell Molding?



Because

foundrymen themselves set the standards to which SHALCO is built

LOW COST—Shalco can be put in operation for less than $3000.

HIGH PRODUCTION RATE—Original dual dump box design assures top productivity. Shalco users report output up to *two shells per minute.*

PRECISION—Shalco's precision construction, automatic timer, and thermostatically controlled pattern temperature guarantee accurate, precise shells.

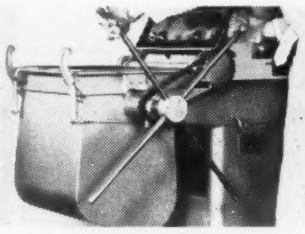
FLEXIBILITY—Shalco is fully adaptable to long or short run jobs. Patterns can be changed in a matter of minutes.

RUGGEDNESS—Shalco is "built to take it." Heavy duty construction, top quality components, and sealed ball bearings provide for hardest production line service, virtually eliminate maintenance.

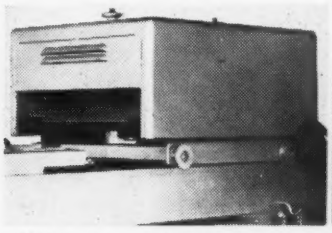
EASE OF OPERATION—Unskilled workers can consistently produce perfect shells with minimum training.

TECHNICAL ASSISTANCE—Shalco's trained field staff provides expert assistance to foundries. The Shal-Tec Bulletin keeps foundries informed on latest technical developments.

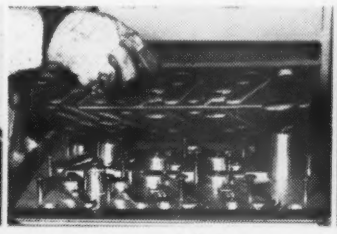
Write today for Bulletin 539-5, free copies of Shal-Tec Bulletin, and name of nearest Shalco representative.



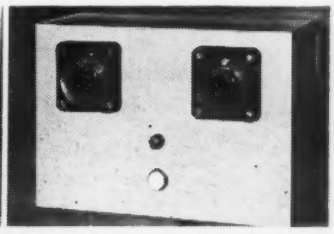
Exclusive dump box design assures uniform sand distribution and dense, uniform shells. Counter-balanced pattern frame, single capstan control, automatic clamps minimize operator effort.



9000-watt oven with stainless steel reflector, fiberglass insulation, automatic doors, provides top efficiency, rapid, uniform curing. One oven serves both patterns.



Positive pneumatic shell ejector assures smooth, effortless removal of shell. Precision ground ejector plate and tubular guides prevent shell breakage or distortion.



Automatic timer controls investment and curing cycles, eliminates guesswork.

See SHALCO, America's most popular shell molding machine, at the AFS Convention
Cleveland—May 8 to 14—Booth No. 1013

SHALCO ENGINEERING CORPORATION
81 Encina Ave., Palo Alto, Calif.

SHALLWAY CORPORATION
So. Fourth St., Connellsville, Pa.

SHALCO

Announcing the

Feature by feature,

POWRWORKER **"26" Pallet Truck**
4000 and 6000 lbs. capacity

POWRWORKER **"26" Platform Truck**
4000 and 6000 lbs. capacity

POWRWORKER **Tilting Fork Stacker**
1500, 2000, 2500 and 3000 lbs. capacity

POWRWORKER "26"

it's engineered to meet your own handling requirements

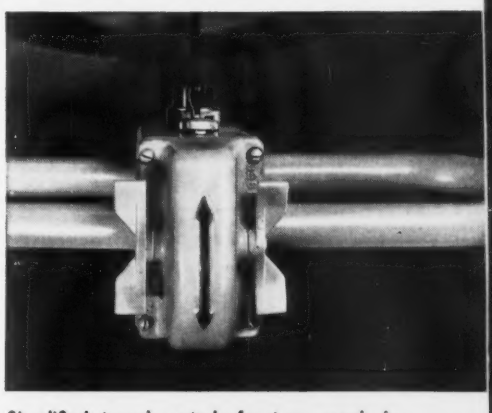
Here's a line of electric trucks designed and engineered with the *user* in mind . . . the 1954 POWRWORKERS. Detailed job-studies in customer plants, warehouses and terminals, dictated the features of the POWRWORKER "26". No truck on the market today can equal the combination of *user-benefits* which the POWRWORKER "26" provides:

- **Maximum Maneuverability**—Only 26" maximum lost length (the truck is only 26" longer than the load), the shortest standard truck on the market.
- **Light Weight**—Minimum overall weight is maintained by complete fabrication, providing maximum strength for the toughest jobs.
- **Stability**—All operating units, including battery, are mounted in an underslung position close to the floor, providing a low center of gravity for load stability.
- **Great Efficiency**—A double reduction of spur gears transmits power from the motor to the driving axle—maximum ton-miles at minimum power cost.
- **Balanced Load Distribution**—Double lifting cylinders uniformly distribute load for smooth, easy lifting and lowering.
- **Safety**—Protective guard for operator protection, either walking or riding. Deadman switch cuts power when brake is applied and handle returns to vertical position when released by operator.
- **Easy to service**—All operating units are readily available without getting under or dismantling the truck—maximum accessibility. The standard drive wheel tire is quickly demountable.

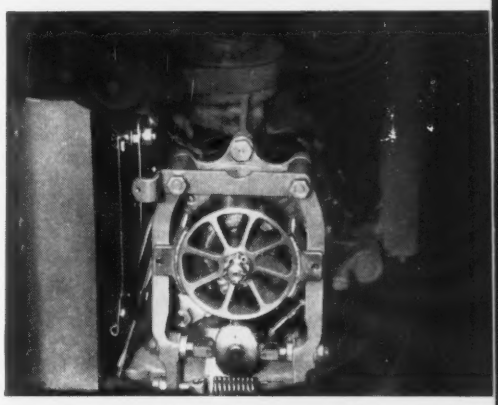
We invite you to compare the 1954 POWRWORKER with any truck on the market. Feature by feature, it's engineered for lowest-cost handling, long-life under tough working conditions. It's easy on the operator, easy on the maintenance man.

For details on the POWRWORKER "26"—the one electric truck built to *your* specifications—call your local Clark dealer, listed in the Yellow Pages of your phone book. Or simply send in the coupon for descriptive literature.

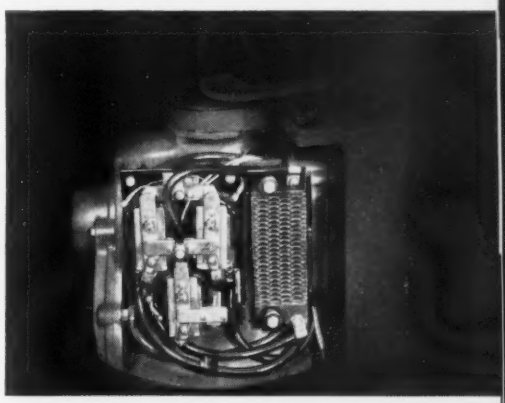
The *POWRWORKER* "26" is at your disposal under Clark's Pay-As-You-Go lease plan. Ask your Clark dealer about this low-cost leasing plan.



Simplified travel controls for two speeds in either direction with operator protection.



Positive spring-applied brake on motor shaft transmits braking force through a gear ratio of 22-1 to driving wheel. Safety with smooth performance.



Control panel is mounted on the power head, sealed in a dust tight box—no long flexing wires or current collectors—all contractors have silver-to-silver contacts for long life.

CLARK EQUIPMENT

POWRWORKER SECTION
Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek 16, Michigan

☐ Please send POWRWORKER literature.
☐ Have representative call.

Name_____

Firm Name_____

Street_____

City_____ Zone_____ State_____

(Advertisement)

OHIO FERRO-ALLOY BRIQUETS WILL SAVE MONEY FOR YOU!

Foundries Can Slice Costs 7½ to 12% With Briquets

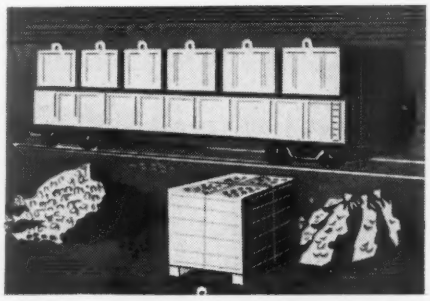
By utilizing Ohio Ferro-Alloy briquets you can use more scrap and less pig iron in your cupola. Cost of the charge is materially reduced, especially today when the relative cost of scrap to pig iron is so favorable.

Consider the tables below comparing a typical 1000 pound charge high in pig iron content with that utilizing silicon briquets and increased cast scrap.

Based on current delivered prices, the Ohio Ferro-Alloys briquet mixture represents a saving of 7.5% in Pittsburgh, 10.4% at Chicago, and 12.1% at Philadelphia.

In addition, Ohio Ferro-Alloy briquets can help you make better casting—reduce losses from off-iron. Easy to add to the charge at the cupola, briquets permit close and consistent metallurgical control. Such flexible control results in iron of enhanced physical properties—higher strength, more uniform structure, and better machinability.

Regular use of Ohio Ferro-Alloy briquets permits substantial reduction in raw material inventories. They may be purchased in any quantity from a bag to a carload and are available for prompt shipment packed in bags, in bulk, or in box type pallets at no extra charge.



Ohio Ferro-Alloy briquets are shipped to suit your handling facilities—bulk, bag, box type pallet, gondola or box car.

Cut Your Pig Iron Needs And Use More Scrap

COLOR CODED FOR EASY IDENTIFICATION

Color coded for easy identification, briquets of silicon, manganese, silico-manganese and chromium afford you a very effective method of trimming production costs and increasing the efficiency of your operation.

It will pay you to investigate the use of Ohio Ferro-Alloy briquets—for better iron at lower cost. Write us today for details.

PIG IRON MIXTURE

MATERIAL	Weight Pounds	% of Charge	SILICON Per cent	SILICON Weight Pounds	COST* Pitts-burgh	COST* Chicago	COST* Phila-delphia
Pig Iron	400	40.0	2.00	8.00	$10.08	$10.08	$10.44
Returned Scrap	300	30.0	2.20	6.60	5.08	4.55	4.68
Purchased* Scrap	240	24.0	1.60	3.84	4.07	3.64	3.75
Silvery Iron	60	6.0	10.25	6.15	2.01	2.08	2.48
Totals	1000	100.0		24.59	$21.24	$20.35	$21.35
Less Melting Loss, 10%				2.46			
Balance				22.13			

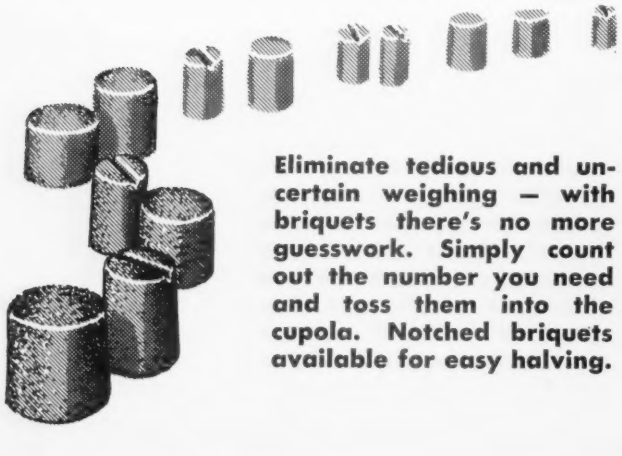
Theoretical Analysis of Iron 2.21% Silicon.

BRIQUET MIXTURE

MATERIAL	Weight Pounds	% of Charge	SILICON Per cent	SILICON Weight Pounds	COST* Pitts-burgh	COST* Chicago	COST* Phila-delphia
Pig Iron	200	20.0	2.00	4.00	$ 5.04	$ 5.04	$ 5.22
Returned Scrap	300	30.0	2.20	6.60	5.08	4.55	4.68
Purchased* Scrap	500	50.0	1.60	8.00	8.48	7.59	7.82
Six Silicon Briquets weighing 15 lbs. containing one lb. Silicon each				6.00	1.04	1.04	1.04
Totals	1000	100.0		24.60	$19.64	$18.22	$18.76
Less Melting Loss, 10%				2.46			
Balance				22.14			

Theoretical Analysis of Iron 2.21% Silicon.

*Based on delivered price per gross ton at destination as of Nov. 15, 1953. Returned and purchased scrap priced at cost No. 1 cupola grade.



Eliminate tedious and uncertain weighing — with briquets there's no more guesswork. Simply count out the number you need and toss them into the cupola. Notched briquets available for easy halving.

PHILO BRAND · TACOMA BRAND · BRILLIANT BRAND

DEPENDABILITY · QUALITY · SERVICE

Ohio Ferro-Alloys Corporation

Canton, Ohio

Chicago Detroit Pittsburgh Tacoma Seattle
Minneapolis Birmingham San Francisco Los Angeles

At Janks Sandblasting Co., The Pangborn Blastmaster® Barrel

Cuts Cleaning Time from 1¼ Hours to 3 Minutes!

The Janks Sandblasting Company, Syracuse, N. Y., is a commercial blast cleaning firm handling ferrous and non-ferrous work. Recently the installation of a Pangborn Blastmaster Barrel, in a special below floor-level pit, has enabled Owner Bob Janks to lower his operating costs and charge his customers much less. How so? Certain typical items used to require an hour and 15 minutes to clean. Today the Blastmaster cleans them in *3 minutes* and gives a fine finish! No wonder Mr. Janks calls the Blastmaster "an excellent machine"!

Do *you* want a *better* finish . . . in *less* time . . . at *lower* cost? Then investigate the Pangborn Blastmaster Barrel, available in ½, 3, 6, 12, 18 and 27 cu. ft. capacities. The letter that takes a minute to write may save you hundreds of dollars a year! Write for Bulletin 223: PANGBORN CORPORATION, 1400 Pangborn Boulevard, Hagerstown, Md.

PANGBORN'S 50th ANNIVERSARY—1904-1954

Pangborn

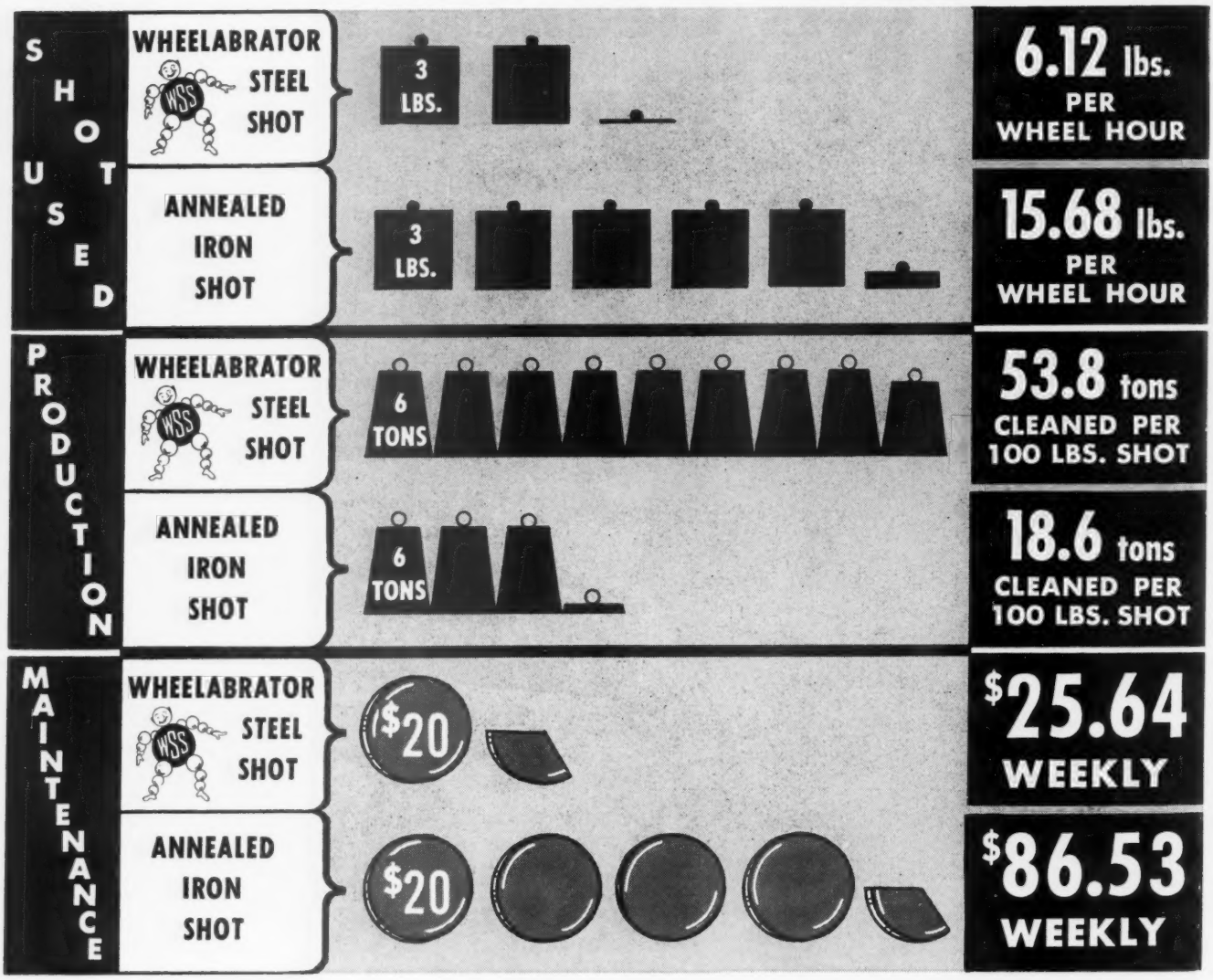
Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment.

MEMBER FEMA

BLAST CLEANS CHEAPER
with the right equipment for every job

*U. S. Patent # 2184926 (other patents pending)

pioneering developments keep WHEELABRATOR® STEEL SHOT first in abrasives



How Gunite Foundries Corp. Saves

with Wheelabrator Steel Shot

Gunite Foundries Corp., Rockford, Illinois wisely switched to Wheelabrator Steel Shot for cleaning semi-steel castings in their Wheelabrator blast cleaning machine. They discovered this superior electric furnace steel shot came out on top on every count compared to the annealed iron shot previously used.

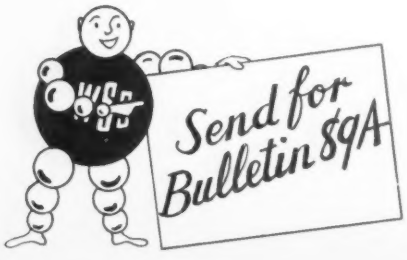
As illustrated in the chart above, important savings were realized in abrasive consumption, increased production and decreased maintenance. In addition, Gunite found a noticeable improvement in the cleanliness and surface appearance of their castings.

Every day more and more foundries of every type are switching to Wheelabrator Steel Shot. The reason is obvious: Performance records in these plants prove convincingly that the lowest overall cleaning costs are achieved with Wheelabrator Steel Shot.

Combining hardness with toughness, this superior shot will clean or peen faster, at lower costs, than any other abrasive. Try it and prove it for yourself.

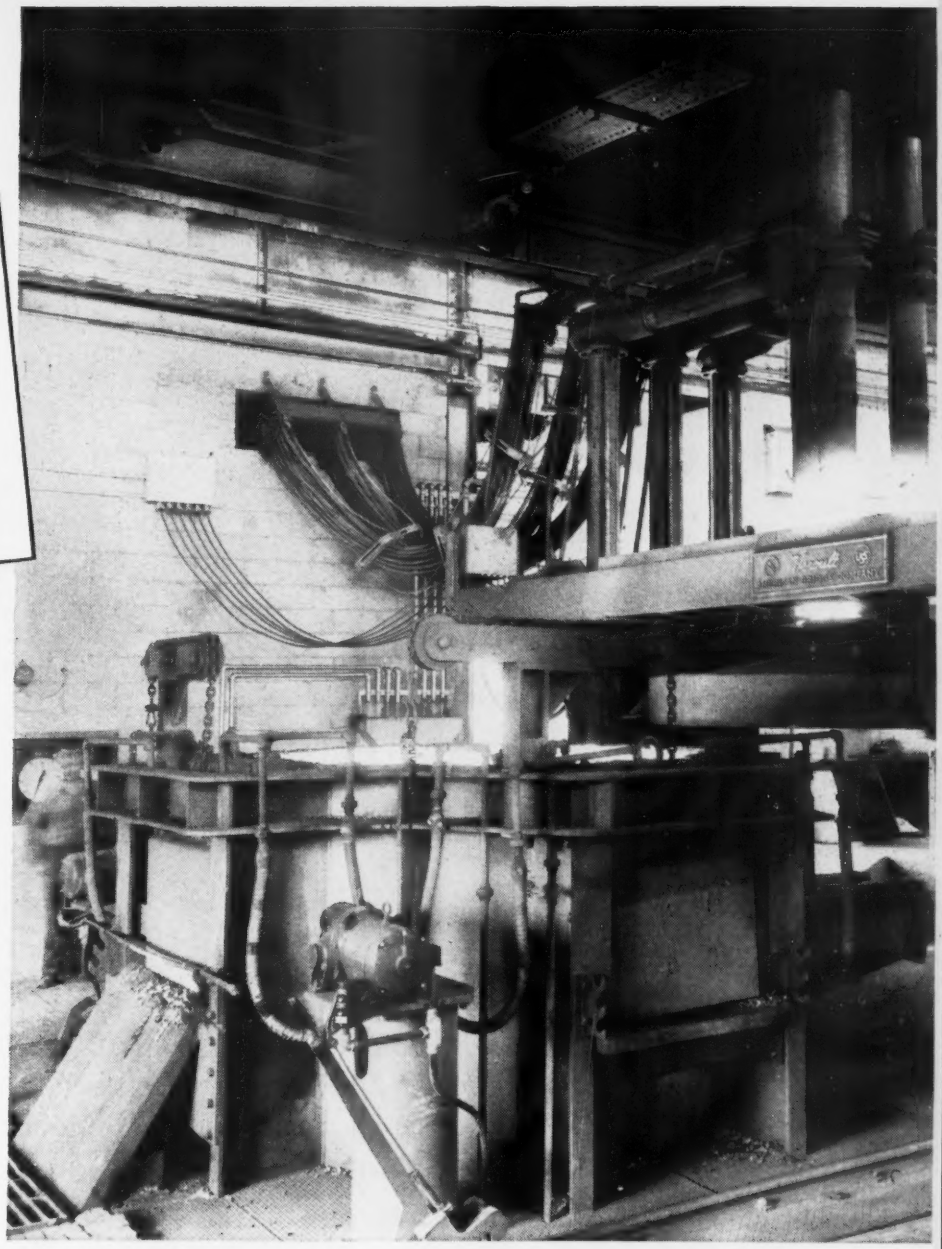
PLUS

50 lb. Cartons and Palletizing. A Scheduled Delivery Plan.



American
WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St., Mishawaka, Ind.

Heroult
ELECTRIC MELTING FURNACES



The high production capacity of the Heroult makes it the foundryman's favorite furnace!

NEW CATALOGUE
Now Ready

Contains up-to-date information on Heroult Electric Melting Furnaces – types, sizes, capacities, ratings, etc. For free copy, write to our Pittsburgh office.

AVAILABLE in foundry sizes with either Gantry or swing-type roof, these widely used furnaces are equipped with the latest time- and labor-saving mechanical devices and electrical controls. They are noted for their efficient performance, low operating and maintenance costs.

We welcome an opportunity to help you select and install the foundry furnace best suited to your requirements.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in New York, Philadelphia, Chicago, San Francisco and other principal cities.
United States Steel Export Company, New York

USS

UNITED STATES STEEL

DELTA
FAST-DRI
CORE OILS ...AND BINDERS

FOR
FASTER PRODUCTION
OF
BETTER CORES
at low cost!

Cores made with DELTA 155-X and 168-X FAST-DRI Core Oils have 1) — an unusually high tensile strength (20% greater than raw linseed oil), 2) — a lower gas ratio, 3) — a higher degree of elasticity and 4) — less core embrittlement.

Core sands made with DELTA FAST-DRI Core Oils have excellent flowability resulting in better workability in core boxes.

The uniformity of DELTA 155-X and 168-X FAST-DRI Core Oils is guaranteed. The chemical and physical constants are maintained by strict laboratory control.

DELTA

Working samples for test purposes together with complete data are available to you. Included, also, will be information on other Delta Core Oils, Delta Dri-Bond and DELTA BONDITE. Your request will receive immediate attention.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

"FOUNDROMATIC" SHAKEOUTS

enough weight to VIBRATE

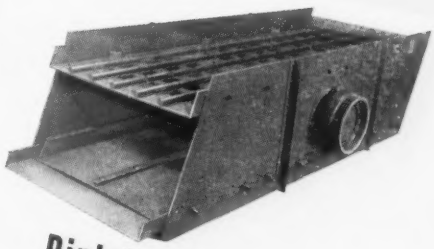
Underview shows why you get years of profitable service from a *Foundromatic* shakeout. The free-floating body includes lateral and longitudinal deck support members and sand hopper in a one-piece welded structure. Stress-relieving the entire unit after welding increases resistance to impact shock load.

The free-floating body of a *Foundromatic* shakeout — illustrated above — weighs more than 40% of shakeout capacity. You needn't worry about low weight ratio retarding shakeout operation with even the biggest castings. You don't have to buy extra capacity to get rapid shakeout.

Low maintenance is the result of its simple, rugged construction. For example, no mechanism shaft has ever broken during operation. Bearings are selected for extra-high service factor. Only one dust seal is needed because of the simple, two-bearing design. A specially designed pivoted motor base assures effective belt tension under all conditions of operation.

"Stopping bounce" has been eliminated too. The new exclusive* automatic snubber control brings the unit to a smooth, quiet stop. Mechanical snubbers — and their replacement — have been completely eliminated. Castings and flasks are not damaged by excessive throw.

*Patented



Ripl-Flo SCREENS

For breaking molding sand lumps — or other foundry screening jobs — you'll find Ripl-Flo screens save floor space and reduce maintenance because of their simple, two-bearing design. Write for Bulletin 07B6151.

You can get complete information from your nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 07B6365B. A-4257

Foundromatic and Ripl-Flo are Allis-Chalmers trademarks.

ALLIS-CHALMERS

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If you're planning to modernize your foundry . . . be sure to see this sensational, new mold blower in operation at the AFS FOUNDRY SHOW—Booth 1012-1111.

FEDERAL

MEMBER FEMA FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC.

The **FEDERAL FOUNDRY SUPPLY** *Company*

4600 EAST 71st STREET, CLEVELAND 5, OHIO

CHATTANOOGA · CHICAGO · DETROIT · LOS ANGELES · MILWAUKEE · NEW Y

EUROPEAN REPRESENTATIVE: SA. PH. BONVILLAIN & E. RONCERAY Rue Paul-Carle a Choisy-Le-Roi, Seine, Fra

natural"

BLOWING MOLDS!

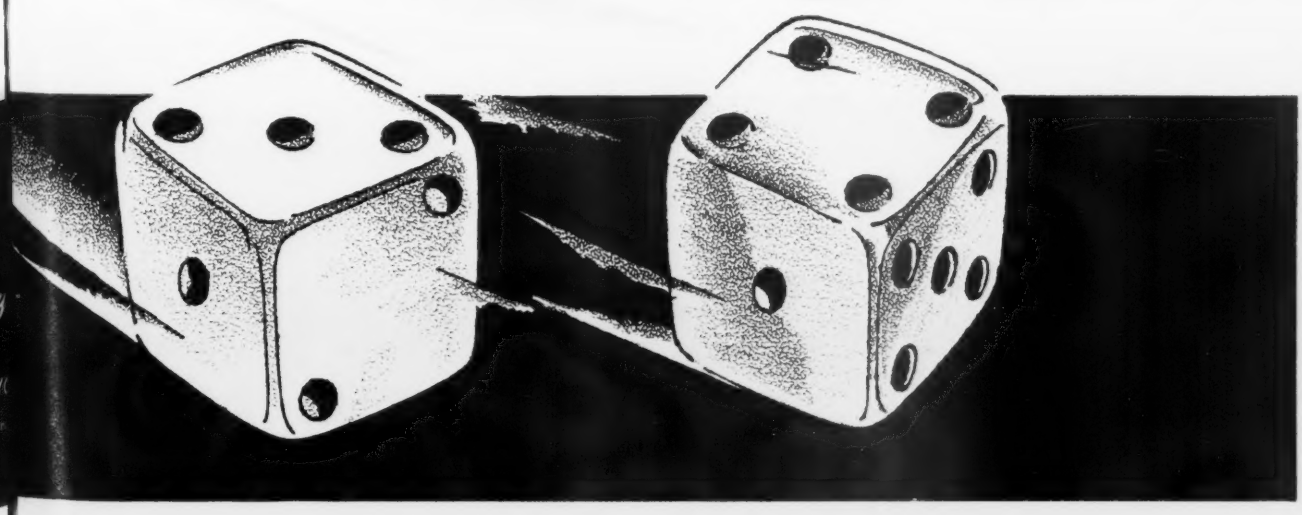
THE SAN-BLO MOLD BLOWER WITH "CYCLO-AIR" BLOW HEAD

The same *exclusive features that made the SAN-BLO *core blower* so efficient and popular have now been utilized to produce an automatic *mold blower* that will blow accurate, uniform molds—quickly and economically.**

* MOTOR-DRIVEN PLOWS move sand in the blow head, keeping it evenly distributed over the blow holes . . . eliminating "piping" or "channeling" in the blow head and preventing the blowing of free-air into the flask.

* AERATING AIR CIRCUIT keeps sand in the blow head fluffed-up, as it is moved to the blow holes by the plows.

* "LPP" (low pressure prefill) prefills the flask with loosely packed sand, using 10 lb. air pressure. This eliminates destructive sand blasting of the pattern . . . holds pattern wear to a minimum and prevents the sticking of sand to the pattern. After prefilling, full line pressure is automatically cut in for final blowing of the mold.



SAFEGUARD YOUR PERSONNEL and your PROPERTY!

Eliminate dangerous gases, fumes and dust with a MULTI-WASH collector

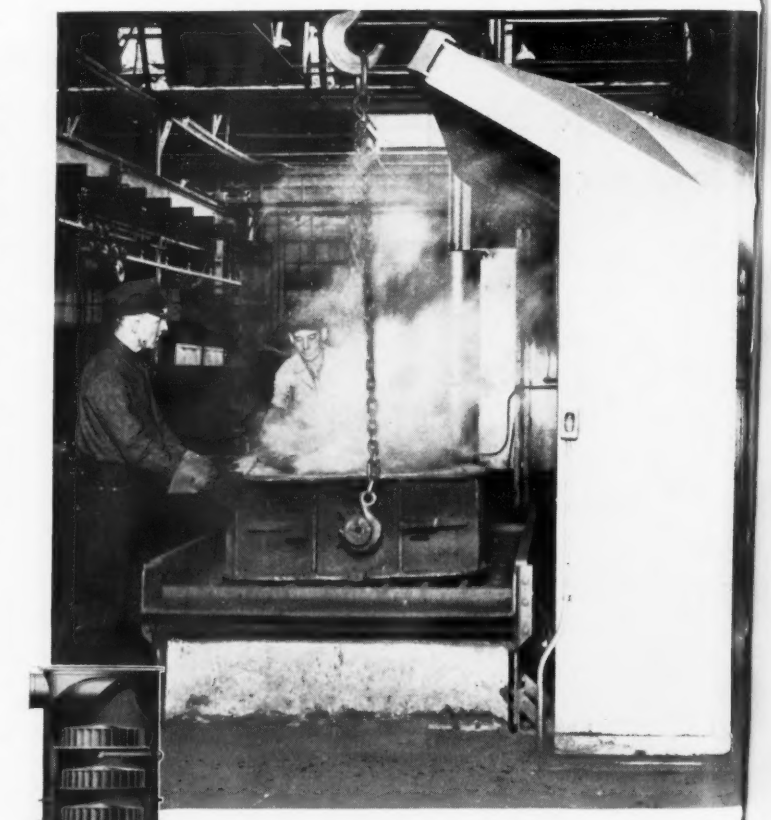
It will pay you to consider the many advantages of a Multi-Wash dust collecting system.

With Multi-Wash you won't have to dig yourself out of accumulated dust particles and furthermore you'll eliminate the danger of a spontaneous fire. Personnel too, will find conditions more agreeable and production will increase, because the cause of sick leave due to ailments attributable to dust and fumes will be substantially eliminated.

You can start in a small way to clean up objectionable dust and fumes by installing a Multi-Wash unit in the most offensive area first. Later, you can add on as conditions warrant.

From a dollars and cents approach you'll be far ahead with Multi-Wash both production-wise and maintenance-wise.

Be wise, contact your local Schneible representative or write direct for a further study of your dust and fume problem.



MULTI-WASH

MULTIPLIES WASHING FOR TOP EFFICIENCY

CLAUDE B. SCHNEIBLE CO.

P. O. Box 81, North End Station
Detroit 2, Michigan

Cable address: CBSCO

European Licensee: Elex S. A., Zurich, Switzerland

PRODUCTS:

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

SCHNEIBLE

Late Foundry News

March 26, 1954

HARVESTER TO EXPAND: International Harvester Co. plans an expansion and improvement program at its Indianapolis motor truck engine plant, to cost more than $4 million. The work will include a 14,600-sq-ft addition to the foundry building to provide more space for improved molding, coremaking and casting cooling equipment. The program, to be carried out over the next two years, is intended to give the company a completely up-to-date foundry and machine shop for production of engines used in all of Harvester's motor truck models.

CAPITAL GOODS: Postwar expenditures for capital goods have been little, if any, above normal, based on a trend projection of earlier expenditures and other important economic relationships. Further, there is no indication that the current level of capital expenditures will not be sustained in the future and expanded in accordance with the normal growth trend. These are the conclusions of the Machinery and Allied Products Institute, following an investigation of the subject. Factors in support of these views are statistically developed in issues of the institute's *Capital Goods Review.*

FOUNDRY EXPANSION: Shenango-Penn Mold Co., Sharpsville, Pa., has been granted a certificate of necessity for accelerated tax amortization covering new plant facilities involving $1,693,250.

Office of Defense Mobilization has revised an expansion goal, making additional research and development laboratories eligible for rapid tax write-off. The original goal covered only those laboratories having defense research contracts with the government which could not be met without facility expansion. Under the revised goal, laboratories established in connection with an industry product or service for which there has been issued a separate expansion goal will be eligible for rapid tax amortization. Covered also are laboratories doing development research which are clearly shown to be in the interest of the defense program.

CONFERENCES: Tenth annual Eastern Seaboard Apprenticeship Conference will be held May 26-28 at the Equinox House, Manchester, Vt. Discussion of foundry apprenticeship is scheduled for the morning of May 27. The American Industrial Hygiene Association will meet Apr. 26-29 during the Industrial Health Conference to be held that week at Hotel Sherman, Chicago.

SMALL BUSINESS: In spite of mergers and growth of big business, there are more small business firms in the country than ever before. According to Wendell B. Barnes, administrator of the Small Business Administration, a record number of more than 4,200,000 businesses are operating in the United States today, and more than 95 per cent of them are small.

NOISE CONTROL: Two studies of the problem of reducing unwanted industrial, aviation and other acoustic noise have been released by the Department of Commerce. The reports result from extensive research at the Wright Air Development Center. One volume, *Handbook of Acoustic Noise Control,* studies the generation of sound stimuli and the problems of their control. It sells for $4. Volume II of the same title approaches the problems of noise control by a study of the effects of noise on human behavior, work performance, body functions other than hearing, and on the after-effects of noise on hearing. It is priced at $3. Both books are available from the Office of Technical Services, U. S. Department of Commerce, Washington 25. (For a brief discussion of noise control, see the article starting on page 112 of this issue.)

MACHINE TOOLS: Shipments of machine tools last year were valued at $1,191,200,000, compared with $1,125,900,000 in 1952, according to the National Machine Tool Builders' Association. The slight gain resulted chiefly from completion of holdover defense orders originating with the Korean emergency. Backlogs at the end of 1953 equaled about six months' production at current capacity, against ten months at the end of 1952.

AIDS INDIAN FOUNDERS: John F. Schnur, foundry technologist of the Armour Research Foundation, has returned to India to assist in the establishment of a training center for foundrymen at the Indian Institute of Technology in Kharagpur. The work is under the joint sponsorship of the government of India, the Institute of

Indian Foundrymen, the Indian Institute of Technology, and the U. S. Technical Co-operation Mission in India. Mr. Schnur first went to India two years ago at the request of the Indian government under a contract signed by the U. S. government with the Armour Research Foundation. He was asked to return to continue his work, which has been credited with substantially increasing production of some foundries.

RALPH DITTY DIES: Ralph Ditty, 77, for more than 30 years president of the Federal Foundry Supply Co., Cleveland, died Mar. 16. He helped to organize the company in 1907.

PERSONALS: William Kerber, on leave of absence as vice president, Hanna Furnace Corp., Buffalo, will become director, Iron and Steel Division, Business and Defense Services Administration, on Apr. 1 . . . Joseph M. Schaeffer, recently vice president, has been elected president, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., succeeding Richard L. Wilcox, who was elected chairman . . . R. Clyde Wolfgong, since 1952 general sales manager, Electro Refractories & Abrasives Corp., Buffalo, has been made vice president in charge of sales. George B. Michie, a vice president since 1945, has been appointed to the new office of director of public relations . . . N. E. Duval has been elected president of Michiana Products Corp., Michigan City, Ind., succeeding O. M. Carry, retired . . . H. E. Fellows, vice president, Lester B. Knight & Associates Inc., Chicago, has been appointed manager of the Foundry Equipment Division of Davenport Machine & Foundry Co., Davenport, Iowa.

MISCELLANY: Thiem Products Inc., foundry materials manufacturer, plans a $75,000 expansion to its Milwaukee plant. The firm has just marked its tenth anniversary . . . Link-Belt Co. has established a scholarship covering one semester's tuition at the Illinois Institute of Technology . . . Rolle Mfg. Co., magnesium and aluminum foundry, Lansdale, Pa., is expanding its permanent mold casting facilities . . . Philadelphia has put into effect a new and more stringent ordinance affecting air pollution control.

PRICES OF FOUNDRY METALS AND COKE

(As of Mar. 26, 1954)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.50–17.00
OVEN	
Birmingham	$22.65
Chicago	24.50
Detroit	25.50
Erie, Pa.	25.00
Everett, Mass.	23.50
Indianapolis	24.25
Kearney, N. J.	24.00
Milwaukee	25.25
Painesville, O.	25.50
Philadelphia	23.95
Portsmouth, O.	24.00
St. Louis	26.00
St. Paul	23.75
Swedeland, Pa.	23.85
Terre Haute, Ind.	24.05

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$58.50	$59.00
Birmingham	52.88	....
Buffalo	56.50	57.00
Chicago	56.50	56.50
Cleveland	56.50	56.50
Everett, Mass.	63.00	63.50
Fontana, Calif.	62.50	....
Geneva, Utah	56.50	....
Granite City, Ill.	58.40	58.90
Lone Star, Tex.	52.50	52.50
Neville Island (Pittsburgh)	56.50	56.50
Steelton, Pa.	58.50	59.00
Swedeland, Pa.	58.50	59.00
Toledo, O.	56.50	56.50
Troy, N. Y.	58.50	59.00
Youngstown, O.	....	56.50

NONFERROUS INGOT

BRASS AND BRONZE: Red brass, No. 115, 23.50c; tin bronze, No. 225, 34.25, No. 245, 28.50; high-leaded tin bronze, No. 305, 27.75; No. 1 yellow, No. 405, 19.75; manganese bronze, No. 421, 24.25.

ALUMINUM: 99 per cent plus, primary ingots 21.50c. Secondary No. 12 alloy 19.00-19.50. Deoxidizing grades: No. 1 20.00-21.00; No. 4 16.50-17.00.

MAGNESIUM: 99.8 per cent standard ingots 27.00c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 29.75-30.00c, Connecticut valley.

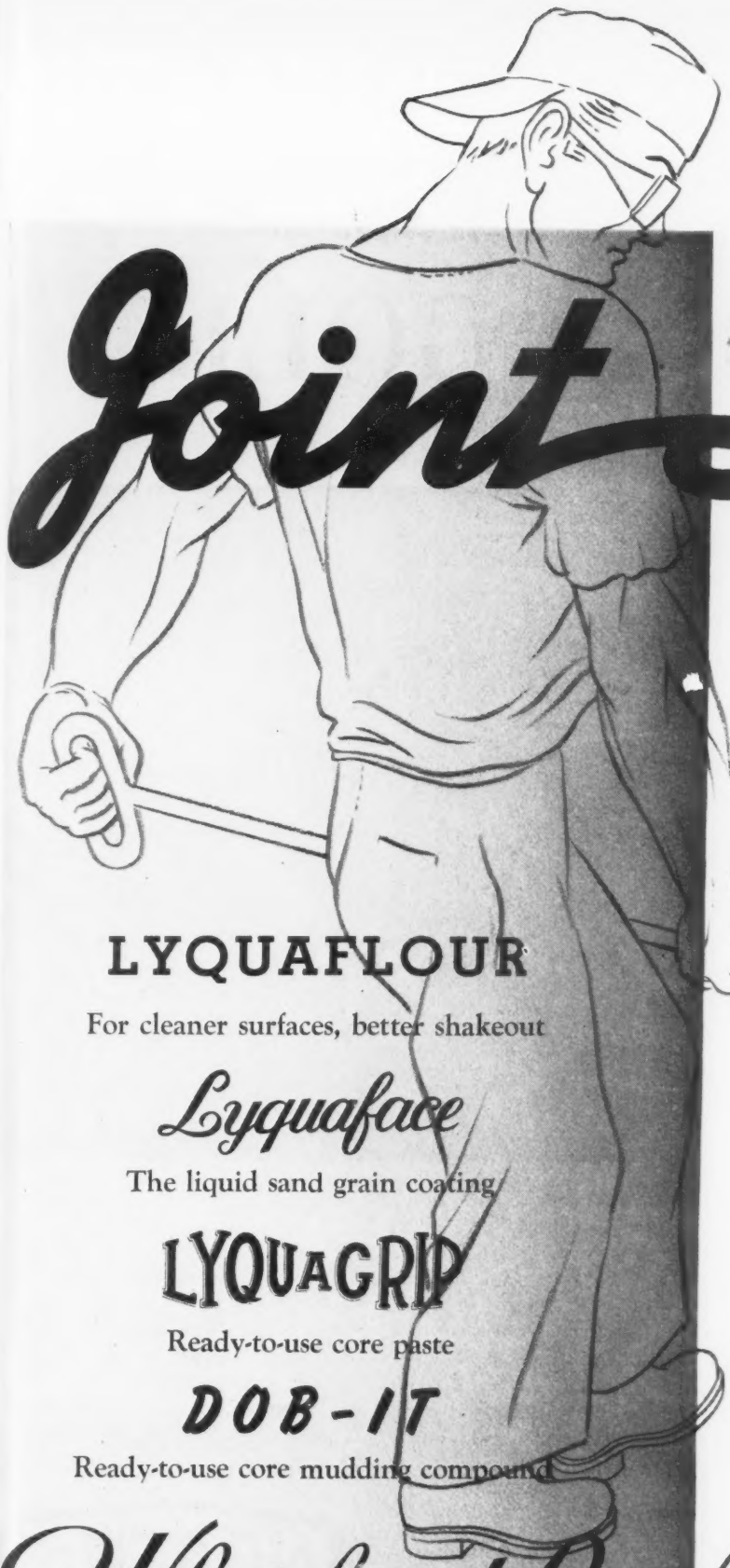
ZINC: High grade 11.10, delivered. Die casting alloy 13.75, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$19.00–20.00	**$39.00–40.00	**$28.00–29.00	.....	.....	.....	$39.00–40.00
Boston*	**13.25–15.00	**29.00–30.00	.....	.....	**36.00–37.00	.....	.....
Buffalo	23.50–24.50	**33.00–34.00	.....	.....	**37.00–38.00	.....	36.50–37.50
Chicago	25.00–26.00	32.00–34.00	.....	36.00–38.00	36.00–38.00	37.00–38.00	40.00–42.00
Cincinnati*	**22.00–23.00	**35.00	**29.00	.....	**40.00	32.00–33.00	42.00–43.00
Cleveland	20.00–21.00	37.00–38.00	22.00–23.00	38.00–39.00	38.00–39.00	38.00–39.00	41.00–45.00
Detroit*	**16.00	**36.00	**25.00	**40.00	.....	**28.00	.....
Los Angeles	20.00	**35.00–38.00	.....	.....	.....	.....	.....
New York*	13.00–14.00	29.00–30.00	.....	.....	.....	.....	.....
Philadelphia	22.00	34.00–35.00	36.50–37.50	.....	40.00	.....	40.00
Pittsburgh	25.00–26.00	35.00–36.00	30.00–31.00	.....	42.00–43.00	.....	43.00–45.00
St. Louis*	24.00	35.00	23.00	37.00	.....	.....	36.00
San Francisco	20.00	39.00	36.00	39.00	43.00	.....	.....
Seattle	25.00	**35.00–37.00	25.00–32.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point.

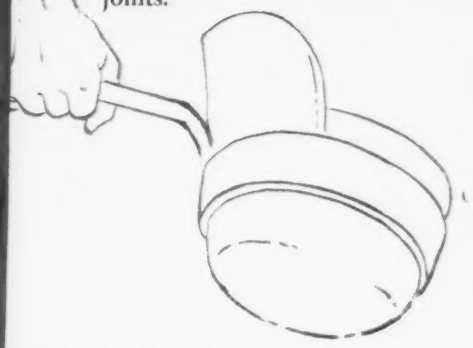


Established 1841

Joint Seal

The time saving, labor saving plastic compound for perfect sealing.

1. **JOINT SEAL** reduces casting cleaning time.
2. **JOINT SEAL** prevents run-outs, insures against thick fins.
3. **JOINT SEAL** gives a complete seal on dry sand molds.
4. **JOINT SEAL** *really* seals off core vents.
5. **JOINT SEAL** forms sealing gaskets for pouring basins and runner boxes.
6. **JOINT SEAL** seals down gate and sprue area on green sand molds.
7. **JOINT SEAL** seals misfit or burned flask joints.



8. **JOINT SEAL** eliminates the old soaking box; will not freeze.
9. **JOINT SEAL** can be applied by our special air gun.
10. **JOINT SEAL** is used for checking chaplet heights.
11. **JOINT SEAL** insures against leakers on pressure castings.
12. **JOINT SEAL** saves time, labor and storage space.

You owe it to yourself to investigate our claims.

LYQUAFLOUR

For cleaner surfaces, better shakeout

Lyquaface

The liquid sand grain coating

LYQUAGRIP

Ready-to-use core paste

DOB-IT

Ready-to-use core mudding compound

Whitehead Brothers Company

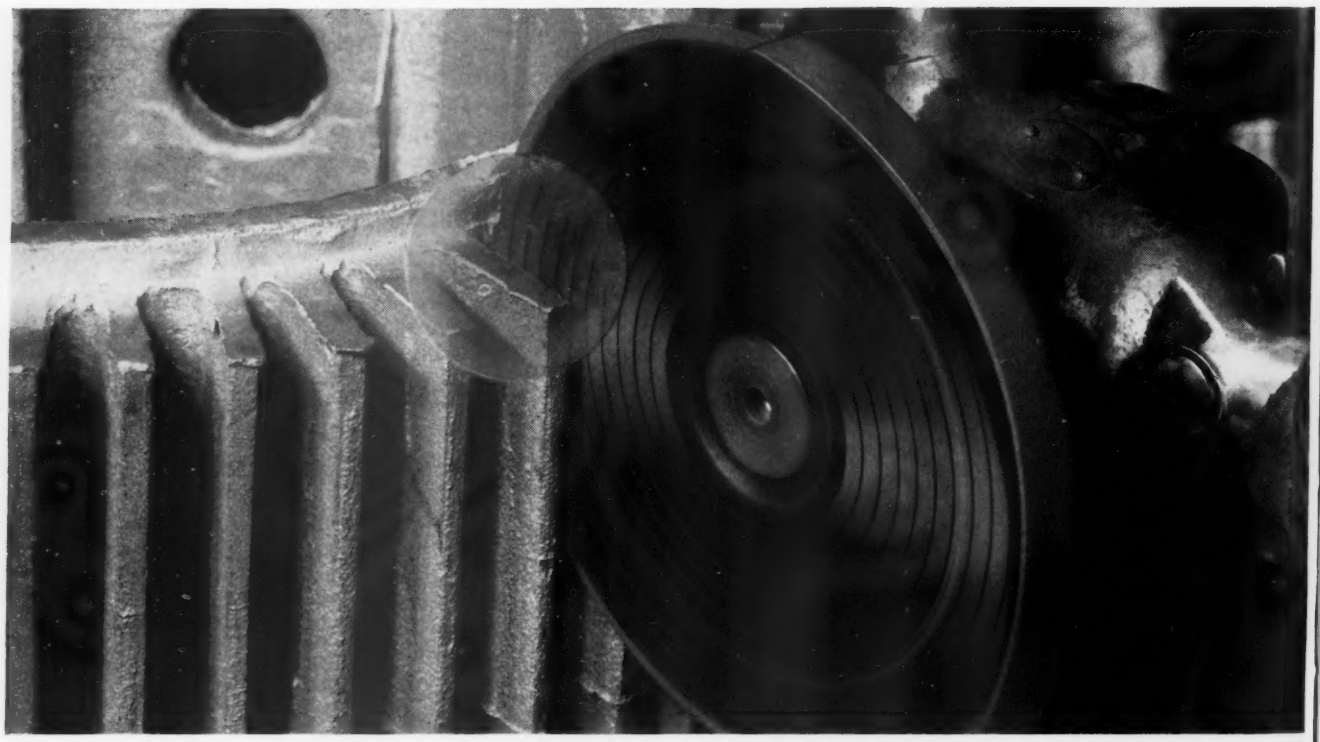
NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence 1, R. I.

Meet the BIG 4 in Reinforced Wheels

Famous Norton team features strength, versatility and safety . . . plus the value-adding

"TOUCH of GOLD"



BD Rigid Hub-Type. Glass cloth and Nylon reinforcement. The preferred hub-type wheel for heavier stock removal. Jobs handled include notching large gates and risers on all kinds of castings, cleaning between teeth of large gear castings, removing rust and scale. Also performs many other slotting and cutting-off operations.

Here's a Norton wheel family that's closely related in a number of ways that add up to better grinding for *you*. Each has strong, laminated construction that provides much more than the usual margin of safety. Each covers a wide range of foundry grinding jobs. And each is engineered to give you fast, trouble-free, economical grinding — the true "Touch of Gold" — every time you put it to work.

The "Big 4" make up a well-balanced team, consisting of two sturdy hub-type wheels (BD rigid and BFR semi-flexible); one light, straight wheel (BF semi-flexible); and one extra strong cut-off wheel (BN). All are resinoid bonded.

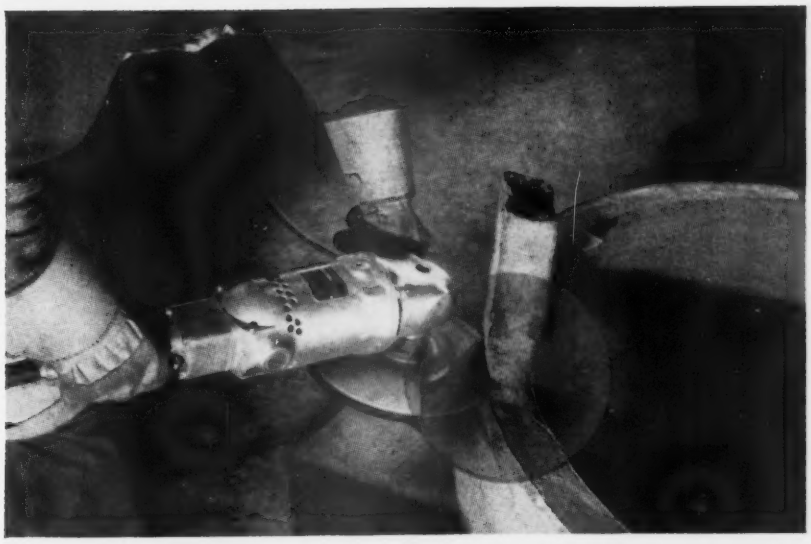
The accompanying action shots can only hint at the "Big 4's" practically unlimited usefulness. Why not find out just how much time and money they can save in your own cleaning room?

Ask your Norton distributor

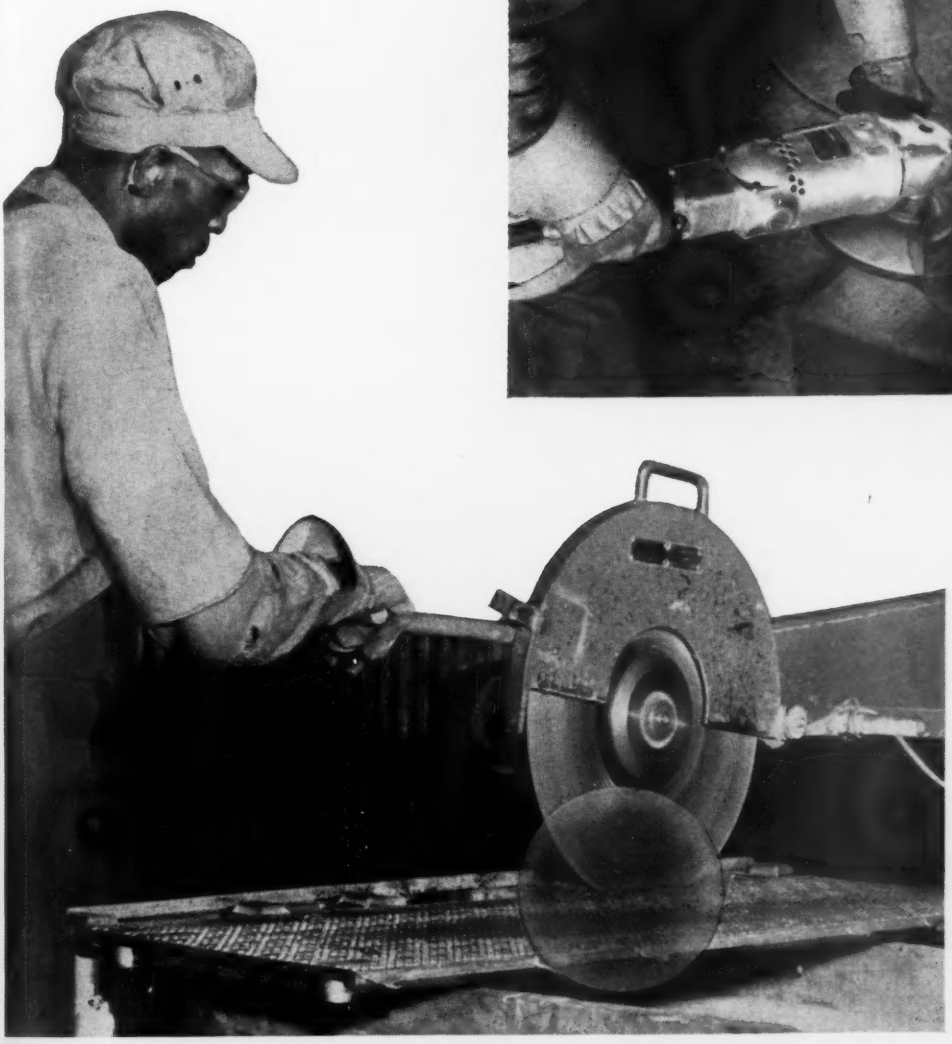
to demonstrate Norton Reinforced Wheels in your foundry. He knows the types and sizes of wheels you need, will be glad to help you in any grinding problems, and will call in a Norton Abrasive Engineer, if necessary. Or write to NORTON COMPANY, Worcester 6, Mass. for the Brand New Catalog on Reinforced Wheels. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. W-1556

NORTON
ABRASIVES

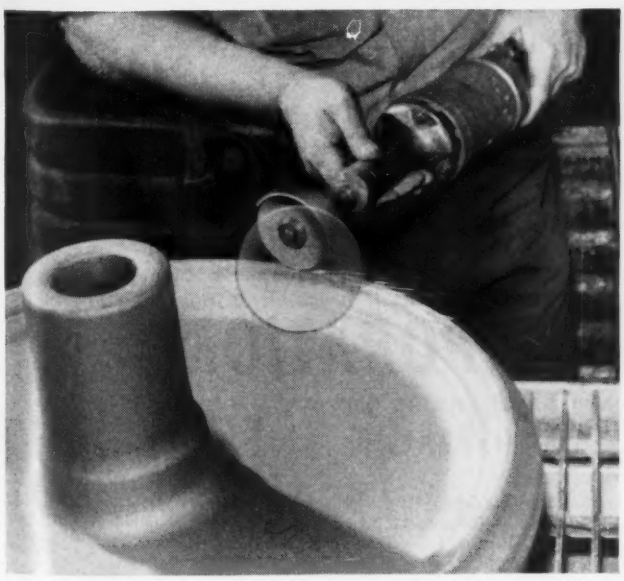
Making better products . . . to make other products better



BFR Semi-Flexible Hub-Type. Cotton fabric and Nylon reinforcement. Most popular light snagging wheel. Also useful for light finishing, removing rust and scale, notching or cutting off gates and risers. Reaches hard-to-get-at places.



BN Cut-off. Glass cloth reinforcement. One of the safest, longest-lasting cut-off wheels in industry. For cutting-off gates and risers from non-ferrous castings, deburring, cleaning, slotting and light snagging on gray iron. Excellent on all types of foundry cutting-off machines, including heavy duty stationary and swing frame types.



BF Semi-Flexible. A straight wheel with cotton fabric construction but without the extra Nylon reinforcement. Ideal for deburring jobs, lighter finishing and many other miscellaneous light portable and bench grinding applications. For periphery grinding only.

BF Mounted Wheels and Points. Same laminated construction as the BF straight wheels, and trued on their own spindles. For light deburring, chamfering, Brinnell spotting, etc. BF sticks, also laminated, provide an easy method of hand-finishing.

YOU CAN *Cut* DEFECTIVE CASTINGS

WITHOUT INCREASING COSTS!

Your foundry can completely eliminate many causes of defective castings, drastically reduce others, with

ALSIMAG® *Ceramic* STRAINER CORES

FREE TEST SAMPLES

Samples of standard sizes free on request. Samples made to your specifications at reasonable cost. Test them in your own foundry.

WRITE FOR BULLETIN 532

Details on AlSiMag Strainer Cores—standard sizes and custom designs—and AlSiMag Cut-off Cores, Troughs, Gate Tubes, and Precision Cores.

Made of specially developed compositions, AlSiMag Cores will not erode or disintegrate under the heat and shock of pouring. They provide even, controlled metal flow and always deliver clean metal to the casting. They are gas free and are not affected by moisture. Inclusions are reduced to a minimum and freeze-offs are eliminated. AlSiMag Ceramic Strainer Cores *always* result in more good castings per moulder per hour!

Yet all these advantages cost you nothing extra. AlSiMag Cores are low in cost, will not break in storage and handling. They are not affected by moisture, and are flat and uniform. Convenient cartons speed the moulder's work. When you try them, you'll find that AlSiMag Ceramic Strainer Cores are more economical to use than shop-made sand cores!

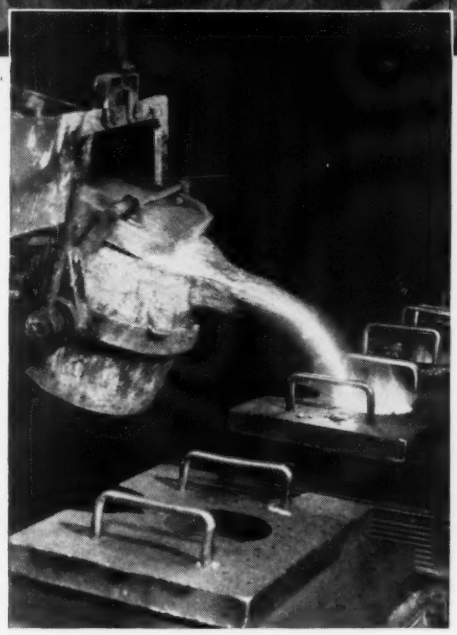
AMERICAN LAVA CORPORATION

A SUBSIDIARY OF MINNESOTA MINING AND MANUFACTURING COMPANY

CHATTANOOGA 5, TENNESSEE

REPRESENTATIVES: M. A. BELL CO., 217 Lombard St., St. Louis, Mo. • 3201 Sherman St., Houston, Texas • 3430 Brighton Blvd., Denver, Colo. • CANADIAN FOUNDRY SUPPLIES & EQUIPMENT LTD., 4295 Richelieu St., Montreal 30, Quebec • 49 Main St., Toronto 14, Ontario • FIRE BRICK ENGINEERS CO., 2400 S. 43rd St., Milwaukee 1, Wis. • E. J. WOODISON CO., 7415 St. Aubin Ave., Detroit 11, Mich. • 146 Chandler St., Buffalo 7, N. Y. • FRED H. McGEE, 120½ E. 7th St., Chattanooga, Tenn. • SMITH-SHARPE CO., 117 27th Ave., Los Angeles 58, Calif. • INDIANA PRODUCTS CO., 400 Union Bank Bldg., Kokomo, Ind. • HOFFMAN FOUNDRY SUPPLY CO., 1193 Main Ave., Cleveland, Ohio • EASTERN FOUNDRY SUPPLIES, INC., 109 Frelinghuysen Ave., Newark 5, N. J. • FOREMOST FOUNDRY SUPPLY CO., 645 N. Pine Ave., Chicago, Ill. • SPRINGFIELD FACING CO., N. Chicopee St., Willimansett, Mass.

52 ND YEAR OF CERAMIC LEADERSHIP



"Our molders (see top photo) prefer Edco Bottom Boards because they are lighter and easier to handle . . ."

"Our EDCO Dowmetal Bottom Boards Hold Up at High Temperatures . . ."

says ROBERT H. GARRETT, General Foreman
LEBANON STEEL FOUNDRY, LEBANON, PENNSYLVANIA

Lebanon Steel Foundry, a three-year-user of Edco Bottom Boards, is a producer of high quality stainless, special alloy, and carbon steel castings.

"In pouring steel at high temperatures ranging from 2900 to 2980 degrees F., we have found that our Edco Dowmetal Bottom Boards require replacement much less frequently than wood boards" reports General Foreman Garrett.

"Because we use thousands of bottom boards in our operation," he continues, "the fact that we can stack Edco boards in less than half the space required by wood boards is a real advantage. Our molders prefer Edco magnesium Bottom Boards because they are lighter and easier to handle than wood boards."

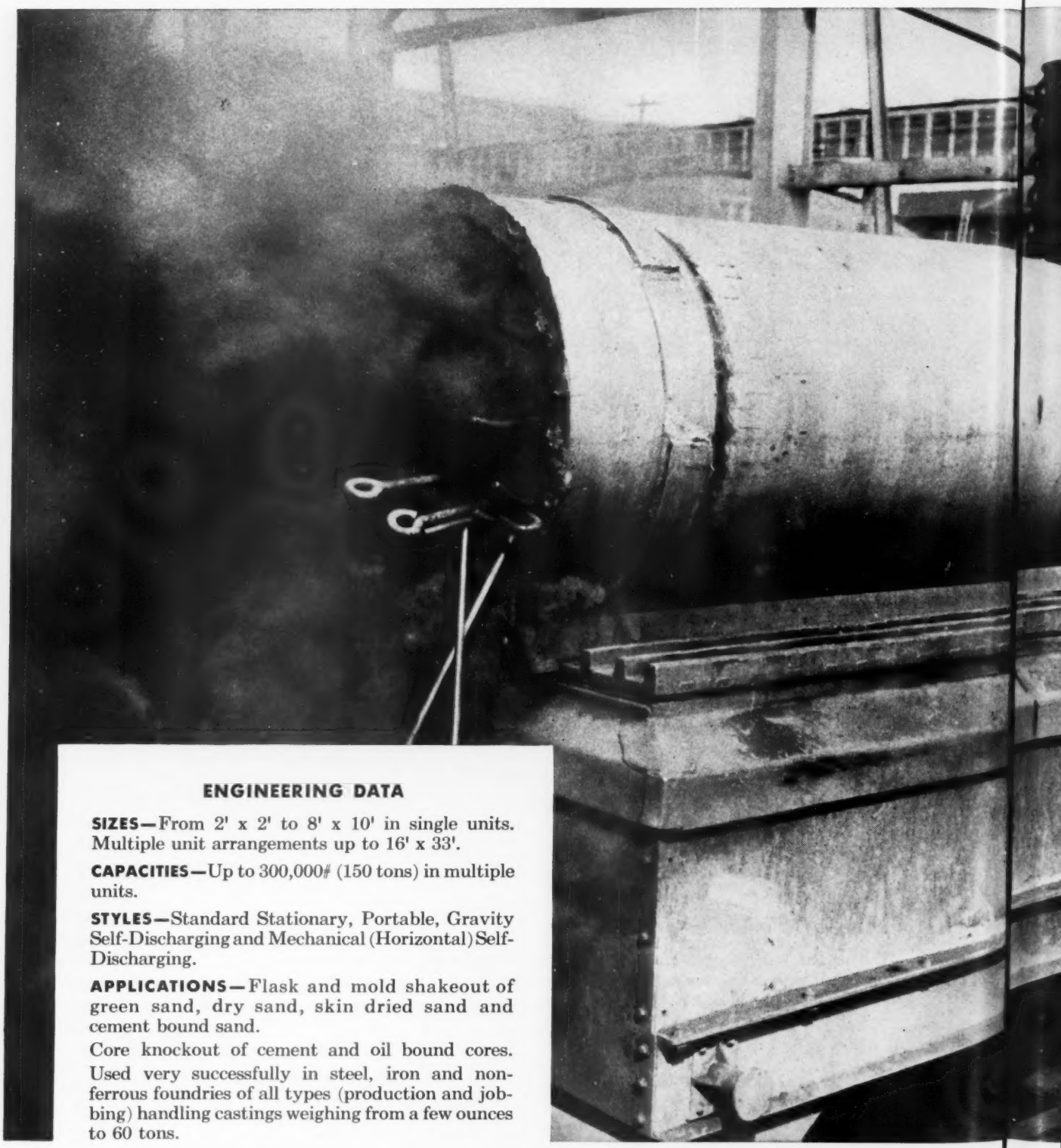
Lebanon Steel Foundry is typical of scores of foundries, of all types and sizes, that are switching to Edco Dowmetal Bottom Boards because of their performance *and permanence.*

Write today, or phone MAnsfield 6-7330 for price schedule and list of 83 standard sizes available from stock.

CHRISTIANSEN CORPORATION

210 SOUTH MARION STREET
OAK PARK 1, ILLINOIS
ALUMINUM ALLOY INGOTS

Floatex Shakeout Saves



ENGINEERING DATA

SIZES—From 2' x 2' to 8' x 10' in single units. Multiple unit arrangements up to 16' x 33'.

CAPACITIES—Up to 300,000# (150 tons) in multiple units.

STYLES—Standard Stationary, Portable, Gravity Self-Discharging and Mechanical (Horizontal) Self-Discharging.

APPLICATIONS—Flask and mold shakeout of green sand, dry sand, skin dried sand and cement bound sand.

Core knockout of cement and oil bound cores.

Used very successfully in steel, iron and non-ferrous foundries of all types (production and jobbing) handling castings weighing from a few ounces to 60 tons.

HEWITT-ROBIN

EXECUTIVE OFFICES, STAMFORD, CONNECTI

7½ Man-Hours Per Casting

Floatex Shakeout Scores Knockout On Cement-Bonded Sand Core In Less Than 20 Minutes!

CUSTOMER'S PERFORMANCE RECORD

EQUIPMENT:

72" x 120" Hewitt-Robins Portable Floatex® Shakeout.

LOCATION:

The Pusey and Jones Corporation Foundry, Wilmington, Delaware.

CASTING:

Thin-walled paper mill autoclave liners weighing 8000 pounds—measuring 9'5" by 40" diam.—sealed at one end.

CORE:

Hard cement-bonded sand weighing approximately 8000 pounds.

PERFORMANCE:

Less than 20 minutes total knockout time . . . 7½ man-hours saving per casting. During 30 months of operation, in spite of terrific metal-to-metal impact during high-speed knockout, absolutely no casting damage.

RESULT:

Pusey & Jones report unit paid for itself in just one year of operation because of time saved and lack of casting damage.

Here is a partial list of

HEWITT-ROBINS PRODUCTS

that will help you cut handling costs and increase operating efficiency.

MACHINERY

- Belt Conveyors
- Belt & Bucket Elevators
- Car Shakeouts
- Conveyor Idlers
- Dewaterizers
- Mechanical Feeders
- Foundry Shakeouts
- Mine Conveyors
- Reclaiming Systems
- Screen Cloth
- Stackers & Trippers
- Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

- Conveyor
- Elevator
- Transmission

HOSE:

- Acid
- Air & Air Drill
- Barge Loading
- Dust Suction
- Fire
- Fuel Oil & Gasoline
- Gasoline Pump
- Mud Pump Suction
- Oil Suction & Discharge
- Propane-Butane
- Road Builders'
- Rotary Drilling
- Sand Blast
- Sand Suction
- Sea Loading
- Servall®, All-Service
- Steam
- Tank Car & Tank Truck
- Vacuum & Air Brake
- Water & Water Suction
- Welding, Twin-Weld®

•

For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

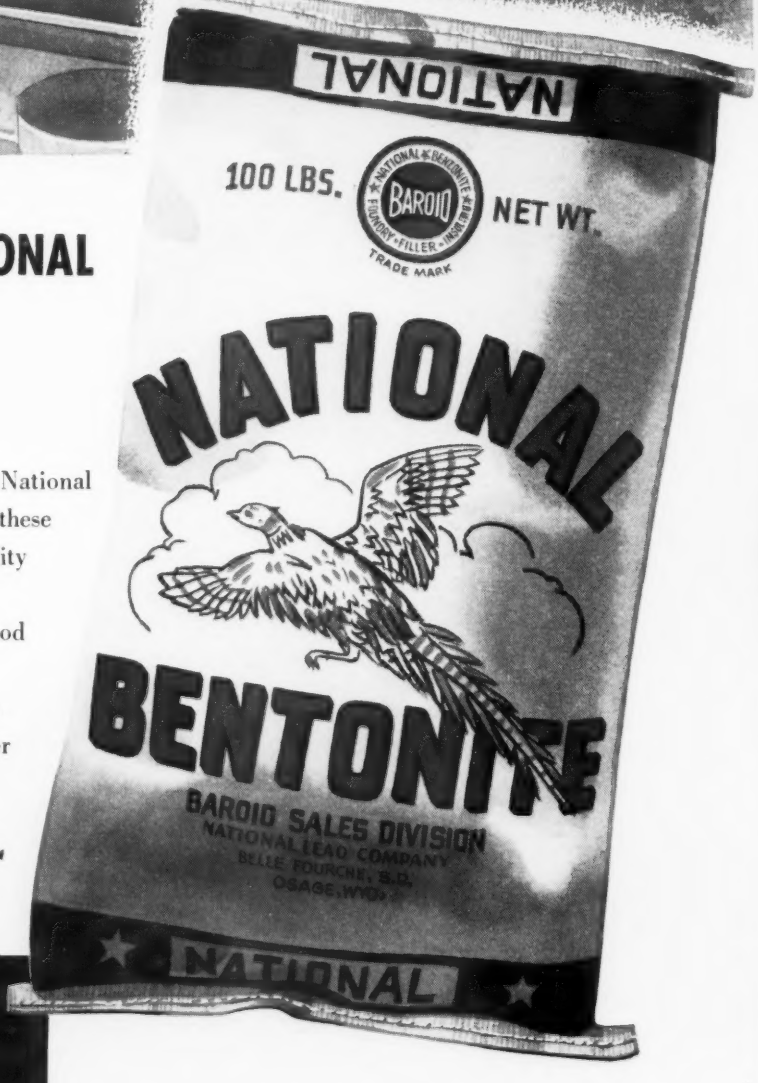
6489

INCORPORATED

ESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
IGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

Why you can count on NATIONAL for better bonded molds . . .

Many good foundrymen have known, for years, that National Bentonite helps them bond a better mold because of these important qualities: consistently uniform high quality . . . good green strength . . . high hot strength . . . high tensile strength . . . high sintering point . . . good mold durability . . . and close laboratory control. They know, too, it yields high permeability, provides high deformation, and requires least water to temper correctly. This all means better production, fewer rejects, and less time in the cleaning room.



Baroid

Quick service from better foundry suppliers everywhere

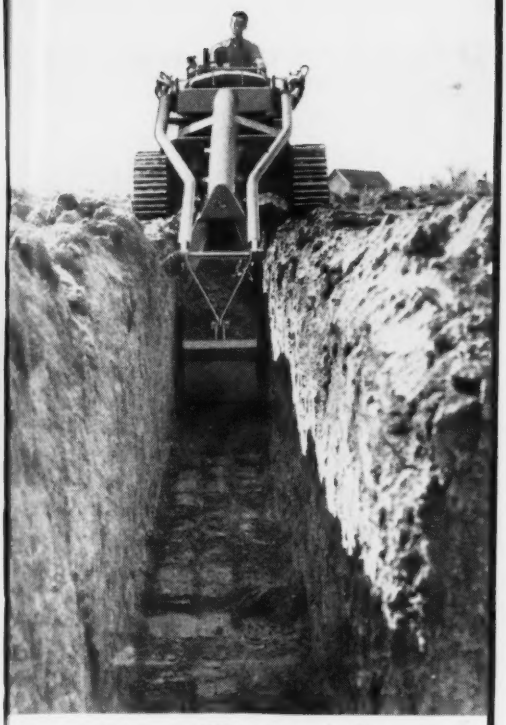
Baroid Sales Division ☆ National Lead Company

Bentonite Sales Office: Railway Exchange Building, Chicago 4, Illinois

4722

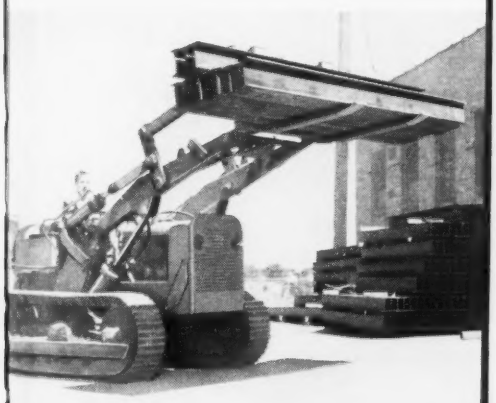
New Materials-Handling Technique Features Tractor Shovel with Quick-Change Front End

Equipment flexibility is an important answer to high production costs. This accounts for the popularity of the thousands of Allis-Chalmers HD-5G Tractor Shovels now in use in plants of all kinds. The 40-hp. crawler, with its wide range of front-end attachments, digs, carries, dumps, stockpiles, spreads or loads materials of all kinds. Its power and versatility enable it to replace a fleet of part-time specialists . . . to pay its way *full time* both in and around the plant.



DIGS TRENCHES — With Trench Hoe attachment, the HD-5G digs a flat-bottom ditch 27 in. wide and to a depth of 8 ft. Ideal for laying pipe, digging foundation footings, other vertical excavations.

HANDLES SAND, CLAY — ANY BULK With standard 1-yd. bucket, the HD-5G loads trucks, feeds hoppers and conveyers, builds stockpiles. Crawler tracks stand up in cullet and other abrasive material as only steel can.



SKIDS, LOADS, STACKS SOLIDS — Lift Fork attachment handles steel beams, pipe, lumber, packaged or palletized loads up to 4,000 lb. Works easily in unpaved yards where rubber-tired equipment bogs down.

OTHER attachments include Narrow Bucket, Rock Bucket, Rock Fork, Tine Fork, Crane Hook and Drag Bucket. Attachments may be interchanged in about 20 minutes by simply removing and replacing four pins. Ask your Allis-Chalmers dealer to show you how the versatile HD-5G can increase efficiency in and around your plant.

SPEEDS YARD MAINTENANCE AND NEW CONSTRUCTION — Bulldozer or Angledozer blades quickly clear or level land for new construction, backfill trenches and foundations, maintain unpaved yard roads.

CLEARS SNOW — Big 2-yd. Light Materials Bucket quickly cleans up and loads snow from yard roads and parking lots. Also doubles output in coal, coke, cinders and other light materials.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

ONE OF A SERIES OF ADVERTISEMENTS TELLING YOU WH

Six minds with but

More light on your grinding problem . . . that's the job of a half-dozen, talented men at Sterling. These experts—engineers, abrasive technicians, production executives, and laboratory analysts—meet daily to consider the correct grinding wheels for our customers' jobs. Six specialists combine their many years of experience to make the tailor-made unit for you. Six men with but a single thought . . . better, more economical grinding from every machine in your plant.

Is this group survey idea important? We think so. So do our customers. Users of Sterling Grinding Wheels appreciate the unusual care that goes into the solution of every grinding problem presented to us. It's that little extra that pays off big. Something only Sterling offers!

We are not too large—or too small—to give every grinding problem the time and study its solution deserves. We do this daily. We are not so busy, however, that we don't welcome the opportunity to show you *on your own machines* the superior results you can gain from using Sterling's "Wheels of Industry." Write or phone us today for this extra service that doesn't cost you a cent!

SEND FOR THESE FOLDERS

This file of Sterling literature will prove valuable. Specifications are available for any kind of grinding. Send for your copies today.

THE STERLING A
OF THE CLEVELAND U

GRINDING WHEEL INSTITUTE MEMBER

TIFFIN, OHIO

SEE US AT THE FOUNDRY CONGRESS AND SHOWBOOTH 18

OUWHY YOU SHOULD USE STERLING GRINDING WHEELS

SINGLE THOUGHT!

THE WHEELS OF INDUSTRY
STERLING ABRASIVES
Plus VALUE
ABRASIVE PRODUCTS
FOR
• BETTER GRINDING
• FASTER GRINDING
• LOW COST GRINDING

GABRASIVES DIVISION
NRUARRIES COMPANY

GRANCHES, CHICAGO—CLEVELAND—DETROIT—PHILADELPHIA
ISTRIBUTORS IN ALL PRINCIPAL CITIES

SHOOTH 1811 AND 1813

New Job Estimates and Incentive Wage Payments are right...

...when they're based on well-engineered standard data

In today's more competitive market, accurate new job estimates and *incentive* wage payments are essential for low cost, profitable operation.

That's why successful foundries are using Knight engineering experience to establish all-important Standard Data.

Standard Data, engineered for your foundry and properly used, insure an accurate basis for estimating—establish a good day's pay for a good day's work—and are used for production scheduling, and cost controls.

Knight-engineered Standard Data are based on a precision analysis of actual time and work required for each phase of your foundry operation. They provide accurate specifications sheets and permanent records for every job.

Your operation will benefit by the broad experience of Knight Engineers, who have completed nearly 400 foundry assignments. A letter will bring a call from a Knight representative at your convenience.

Knight Services Include:

- **Management**
- **Organization**
- **Industrial Engineering**
- **Wage Incentives**
- **Cost Control**
- **Production Control**
- **Materials Handling**
- **Modernization**
- **Mechanization**
- **Automation**
- **Foundry Engineering**
- **Survey of Facilities**
- **Architectural Engineering**
- **Construction Management**

EVIDENCE OF EXPERIENCE

Lester B. Knight & Associates, Inc.

Consulting Engineers

MEMBER OF THE ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC

600 W. Jackson Blvd., Chicago 6

917 Fifteenth St., N. W., Washington 5, D. C. • Lester B. Knight & Associates, 50 Church St., New York 7

FOUNDROMATIC
Dielectric
SAND CORE DRYER

NOW—
these cores dry in 1⅓ minutes ...INSTEAD OF 60!

This is typical of the time savings you can make with a *Foundromatic* core dryer! This unit dries cores in only a small fraction of the time required in conventional ovens . . . literally cuts drying time from hours to minutes.

The method is not only amazingly fast, but core quality is actually improved. Cores have a smooth finish and superior shakeout characteristics.

Using a *Foundromatic* dryer, it is no longer necessary to make cores ahead of time and build up a stock. Cores are not only dried fast, but come out of the dryer cool enough to handle bare handed, and ready to use.

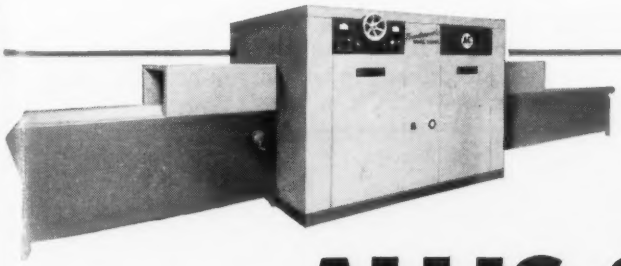
60% SAVING IN HEAT COSTS

There's no waste heat! All heat goes into core. If there are no cores between electrodes, no energy is wasted. Result: low costs . . . no heat, smoke, fumes in core room.

Find out more about this modern core drying. Call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4346

Foundromatic is an Allis-Chalmers trademark.

See our exhibit at the Foundry Congress and Show, Cleveland, May 8-14.

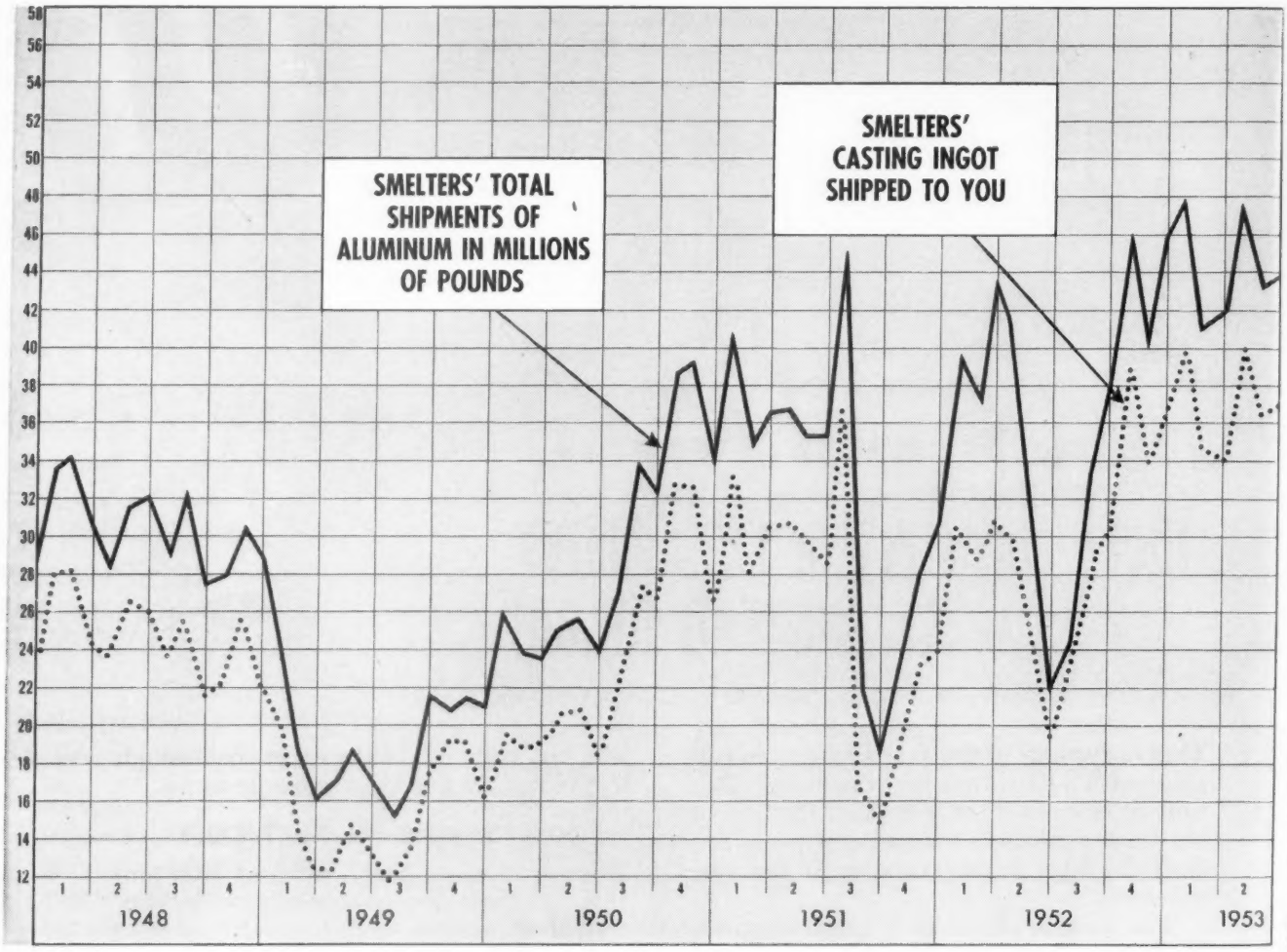


Get This Bulletin!
It is full of facts on dielectric sand core drying. Ask for 15B7306B.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

KEEPING YOU IN BUSINESS IS THE ALUMINUM SMELTERS' JOB!



This chart — made from Bureau of Mines figures on total shipments made by smelters and smelters' own sales records of *casting ingot* shipped—shows at least 80 percent of our business is your business.

It proves graphically, as nothing else could do, that the present and future welfare of the foundryman and die caster is the major concern of his partner, the aluminum smelter. As a business man, the smelter knows that it is only good business to take care of customers who purchase 80 per cent of his production. This is your insurance policy — guaranteeing you a constant and dependable source of supply.

Year after year—no matter how great the demand—your aluminum smelter meets your requirements. He makes highly specialized alloys to fill your needs. He ships on time, whether you need great or small quantities. His production facilities protect you from high inventory costs and expensive work stoppages.

He is a constant and dependable source of supply because he makes it his business to furnish casting ingots as you need them and when you need them.

no foundry ever shut down because ingot was not available from smelters!

ASR

Aluminum Smelters Research Institute
20 North Wacker Drive, Chicago 6, Illinois

the way I hear it, SMITH L-O is your best bet in CORE OIL

DEANE'S STUDIO

Ask the core makers and fellows who pour and they'll tell you how the use of Smith L-O results in better, cleaner, stronger cores. And, one big reason why Smith L-O stands up so well is because of its controlled uniformity and high quality. What's more, these men and their production heads know they can count on a Smith representative to step in and work with them whenever an unusual problem needs to be solved. Yes, look first to Smith L-O . . . the name that stands for a *service* as well as a *product!*

BOOTH 311
AUDITORIUM HALL
AT THE SHOW

SMITH REPRESENTATIVES

- COLUMBIAN WAREHOUSE CO. Reading, Pennsylvania
- FOUNDRIES MATERIALS CO. Coldwater, Michigan
- FOUNDRY SERVICE CO. Birmingham, Alabama
- F. F. SHORTSLEEVE Elmira, New York
- MALCOLM G. STEVENS Arlington, Massachusetts
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- ST. LOUIS COKE & FOUNDRY SUPPLY CO. St. Louis, Missouri
- WESTERN FOUNDRY SAND CO. Seattle, Washington
- WESTERN INDUSTRIAL SUPPLY CO. Portland 14, Oregon

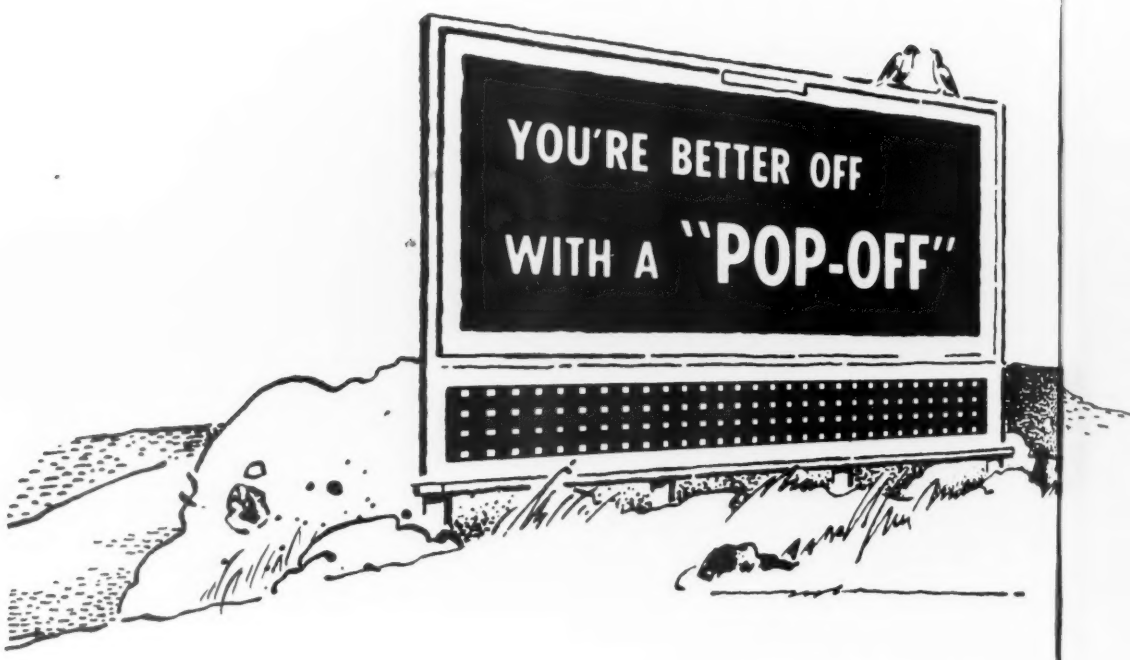
Smith L-O Core Oil

ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.

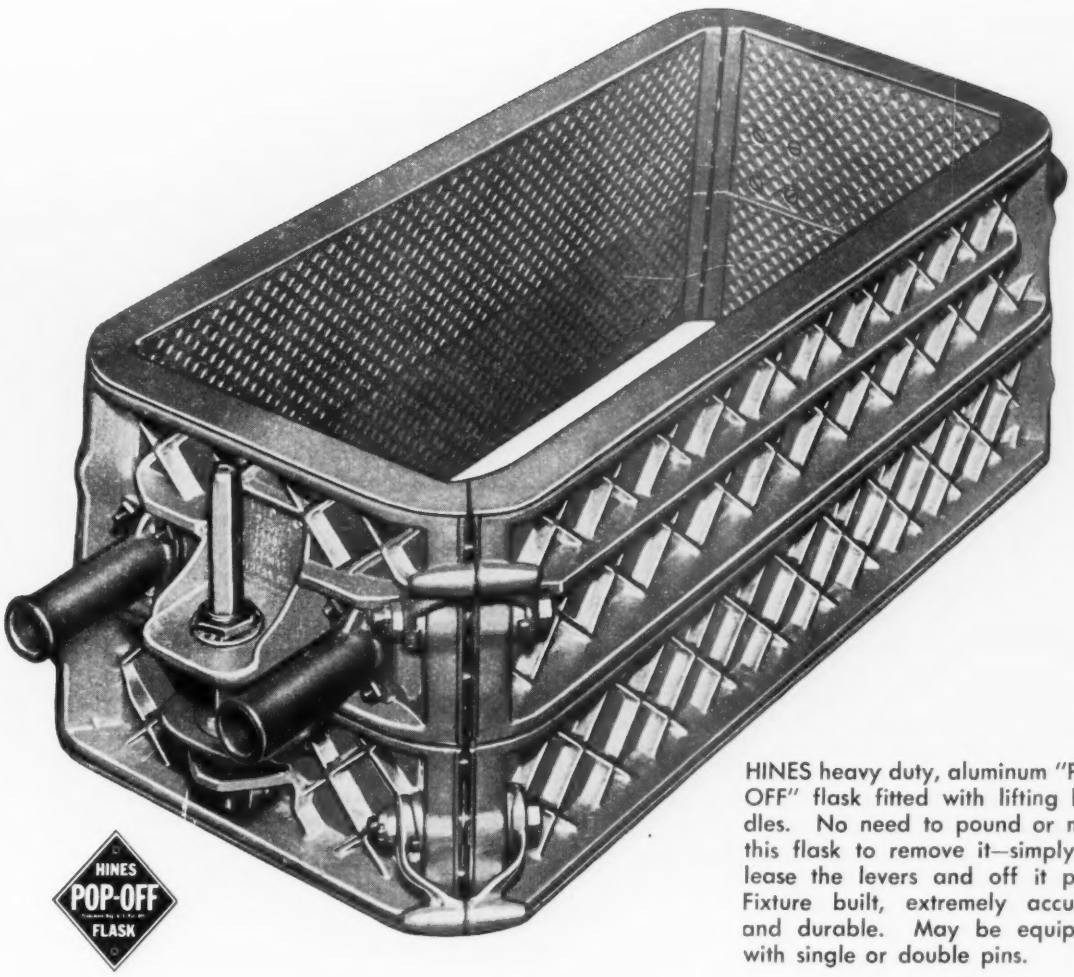
MANUFACTURERS OF L-O AND CERTIFIED CORE OILS
INDUSTRIAL OILS DIVISION • ROCKFORD, ILLINOIS

the fact is...



SEE HINES "POP-OFF" FLASKS AT THE FOUNDRY SHOW—BOOTH 1214

THE HI S

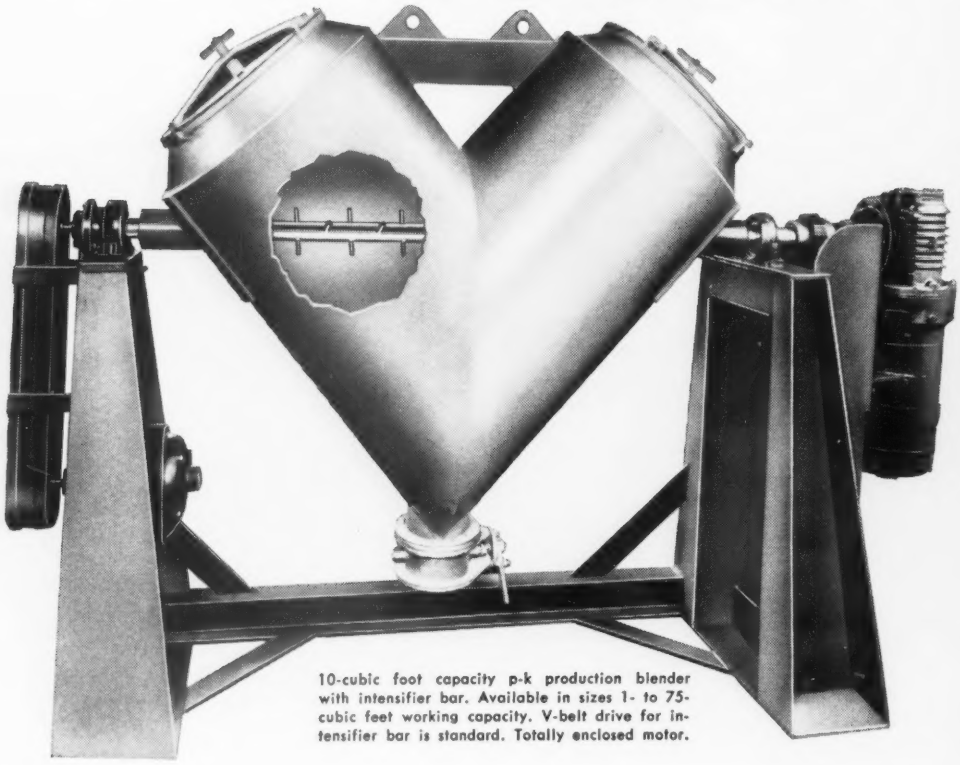


HINES heavy duty, aluminum "POP-OFF" flask fitted with lifting handles. No need to pound or maul this flask to remove it—simply release the levers and off it pops! Fixture built, extremely accurate and durable. May be equipped with single or double pins.

S FLASK CO.

31 WEST 140TH STREET • CLEVELAND 11, OHIO • PHONE ORCHARD 1-2806

Now....it's easy to blend hard-to-mix materials



10-cubic foot capacity p-k production blender with intensifier bar. Available in sizes 1- to 75-cubic feet working capacity. V-belt drive for intensifier bar is standard. Totally enclosed motor.

using p-k twin shell dry blenders with intensifier bar

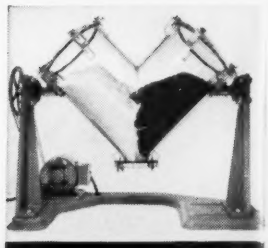
Versatile as **p-k** twin shell blenders are, they are now made even more so with the addition of an intensifier bar.

More kinds of materials can be processed, such as lumps which occur before and during blending and for dispersion of fluids. Variable speed V-belt drive permits adjustment of intensifier bar action to suit material being processed. Quick opening, dust tight cover makes loading quick and easy.

Rotation of **p-k** twin shell blenders, continuously supplies fresh material to the pins which provide intense local mixing action. The high impact combined with shear, effectively breaks up lumps, disperses materials that tend to agglomerate while tumbling and thoroughly disperses dampening quantities of liquids into solid mixes.

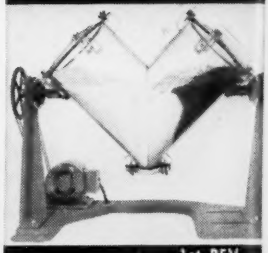
When your process planning includes a blending operation, it will pay you to ask **p-k** for blending tests on your materials and for engineering assistance at the initial planning stage. Since **p-k** also makes double-cone and ribbon blenders, an unbiased analysis of your blending methods is assured. Or, write for factual literature—Catalog No. 12, showing production and laboratory blenders.

simply designed for better blending



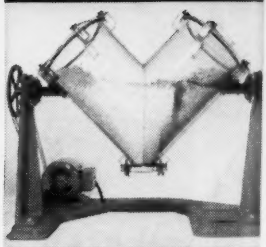
LOAD

As this typical test illustrates, the effectiveness of this new blending principle assures a thorough blend in minutes.



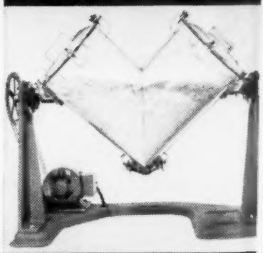
1st REV.

The gentle rolling, folding, dividing and combining action with a simultaneous cross flow can be seen in the first revolution.



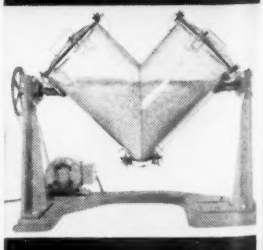
5th REV.

End-to-end dispersion and intimate mixing becomes evident. This is true regardless of particle size, form or density.



1 MIN.

The mass rotates close to the axis and does not require rapid rotation. Neither separation nor attrition takes place.



2 MIN.

A thorough blend has been achieved. Laboratory or pilot plant blender illustrated is available in 4-and 8-quart sizes.

Patented and patents pending

the **Patterson-Kelley Co.,** inc.

1340 Lackawanna Ave., East Stroudsburg, Penn.

1104

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities

Searching for new ways to increase foundry output and efficiency?

CALL IN THE REPUBLIC PIG IRON METALLURGIST

His recommendations and suggestions often result in improved plant operation, increased production efficiency and unit-output with no increase in overhead costs.

The Republic Pig Iron Metallurgist has a solid foundry background gained from years of actual experience. He knows all types of pig irons and their characteristics.

Hundreds of foundrymen regularly keep in touch with the Republic Pig Iron Metallurgist. Why not make it a practice to call him in whenever you need help? There's no cost or obligation for his services.

Let us know when you would like him to call.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

REPUBLIC PIG IRON

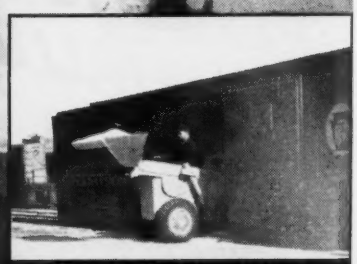
"CHATEAUGAY"	REPUBLIC	REPUBLIC
Low-Phosphorous, Copper-Free	(Northern) Foundry, Basic and Malleable	(Southern) Foundry and Basic

REPUBLIC STEEL

Handles Them All

Sand, Slag, Scrap, Barrels Kegs, Castings, Waste, Bags

CARRYING CASTINGS



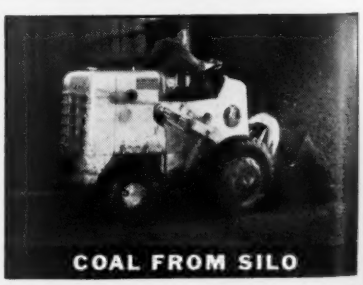
UNLOADING BOXCAR

SAND TO MOLDERS

YOU get your sand-handling operations into high gear when you put "PAYLOADERS" to work. These high-speed tractor-shovels put the skids under sand handling *costs* too. And they are so versatile that they handle many other jobs as well. One man on a "PAY-LOADER" can scoop, shovel, carry, load, unload, pile and spread . . . push, pull and lift . . . indoors or outdoors.

It will pay you to find out what these unusual machines are doing for other foundries and determine the model and size that fits your needs. Your "PAYLOADER" Distributor is ready with the facts. The Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Illinois.

JOB STUDIES are available on request, covering operations in several different plants.



COAL FROM SILO

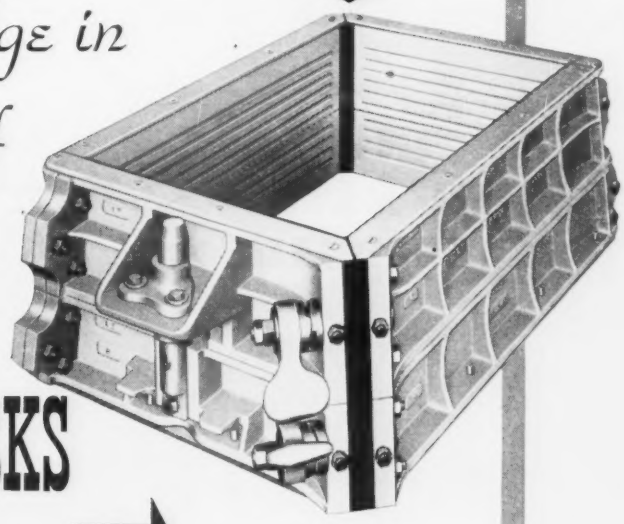
YOU CAN'T COMPETE IF YOUR EQUIPMENT IS OBSOLETE

PAYLOADER®

THE FRANK G. HOUGH CO. · Since 1928

No Sand Can Lodge in Open Corners of

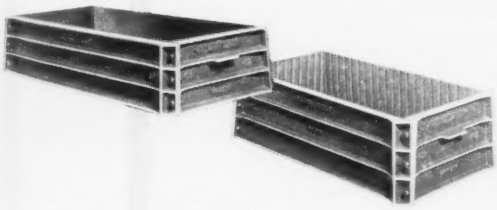
FREMONT SPREADLOCK FLASKS



—the corner gaps are completely closed by long-life, easily replaceable, live rubber corner inserts.

That's just one of the many reasons for the popularity of this new flask. Made of magnesium, which has twice the tensile strength of aluminum, they afford much longer service. Furthermore, magnesium weighs ⅓ less than aluminum, so they are easier to handle.

But more importantly, the accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure more exacting work.

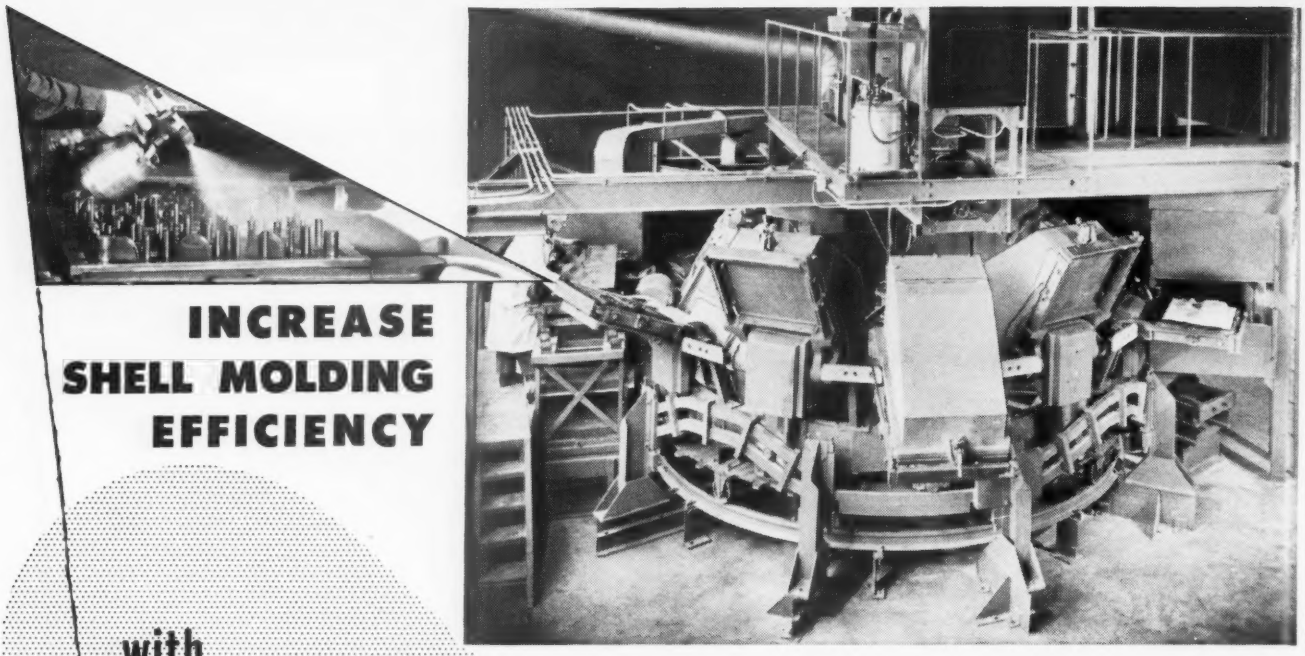


Start Saving Money with **FREMONT CAST IRON OR CAST ALUMINUM JACKETS**

New sides or ends may be easily inserted because of the precision machined and drilled, bolted corner construction. It is no longer necessary to scrap entire jackets. The standard style is designed for ordinary foundry practice, while the grooved style, which permits ready gas escape, is ideal for steel foundries. Flasks and jackets can be assembled on 3°, 4° or 5° taper.

THE FREMONT FLASK CO.
Fremont, Ohio

Write today for free literature and prices on Fremont Spreadlock Flasks, Fremont Standard Slip Flasks (with the GROOV-LOCK FOOLPROOF PIN,) and Fremont Cast Iron or Cast Aluminum Jackets. All orders given prompt attention.



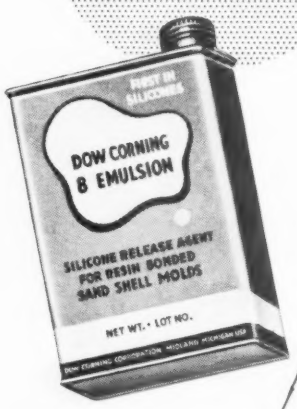
INCREASE SHELL MOLDING EFFICIENCY

with

DOW CORNING 8 EMULSION

Automatic from sand-resin blending to the finished molds, the 12-station shell mold machine developed and built by Mechanical Handling Systems, Inc., of Detroit, is capable of producing 480 shells per hour. Only a single operator is required. The machine rotates counterclockwise through pattern spraying, sand-resin application, curing, and finished shell delivery. An automatic proportioning system for sand, resin and wetting agent is located at the top of the machine.

. . . the Silicone Parting Agent that gives you clean, positive release of shell molds and cores at lowest cost



The more use you make of the shell process, the more continuous your production of clean, accurate shells must be. That's why leaders in this new field specify Dow Corning 8 Emulsion as their parting agent. Equally effective in manual or automatic equipment, this non-corrosive, nonflammable silicone emulsion assures peak production every working day.

That's because Dow Corning 8 Emulsion provides easy release at molding temperatures and will not break down to form a carbonaceous deposit on pattern plates. Nonsticking and nongumming, it keeps patterns cleaner longer and cuts your maintenance costs to the minimum.

Easily diluted in hard or soft water, Dow Corning 8 Emulsion is available at a price some 8% below that of earlier silicone emulsions. It is highly resistant to creaming in storage or after dilution. For lower costs, longer service and positive release, specify Dow Corning 8 Emulsion. Try it yourself at our expense. Send for your FREE trial sample today.

Send for sample TODAY

DOW CORNING CORPORATION, Dept. AH-16
Midland, Mich.

Please send me
- ☐ Free sample of Dow Corning 8 Emulsion
- ☐ Data on Silicone Release Agents for the Shell Process

Name _____

Company _____

Street _____

City _____ Zone ___ State _____

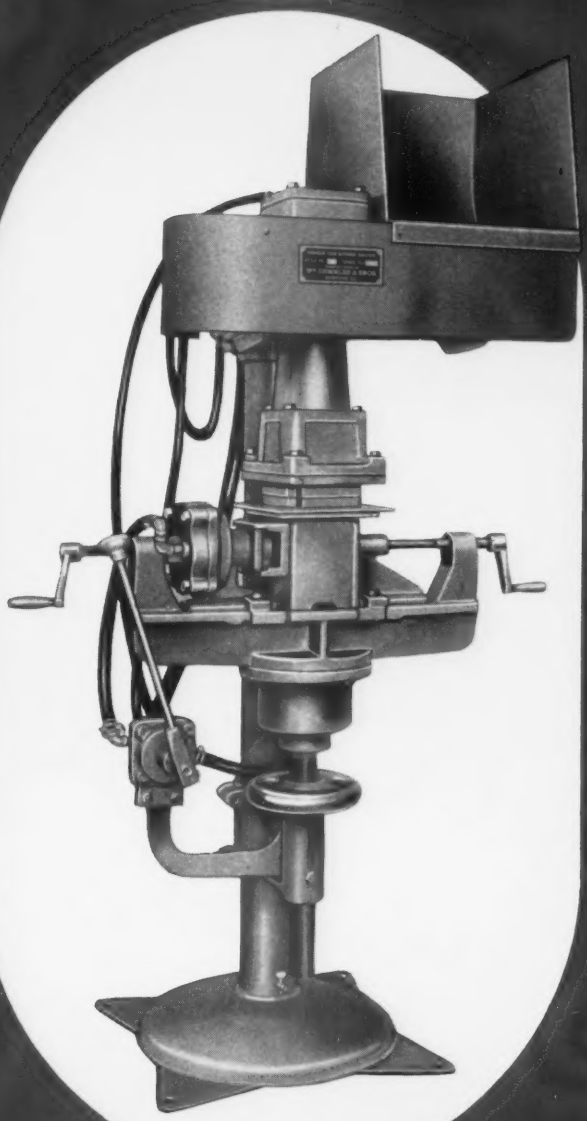
DOW CORNING CORPORATION
MIDLAND MICHIGAN

DOW CORNING SILICONES

ATLANTA CHICAGO CLEVELAND DALLAS DETROIT LOS ANGELES NEW YORK WASHINGTON, D.C. (Silver Spring, Md.)

Canada: Dow Corning Silicones Ltd., Toronto Great Britain: Midland Silicones Ltd., London France: Cie. St. Gobain, Paris

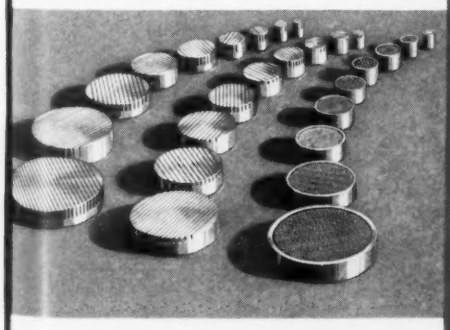
There is no substitute for the skill and knowledge of experience



DEMMLER INTRODUCED THE FIRST CORE BLOWER IN 1909

The DEMMLER model 55 CORE BLOWER

Whether it be in science or engineering, experience is the foundation on which ideas and improvements are built. Based on 45 years of core blower designing, the Demmler 55 is the perfect answer where your core blowing requirements call for fast, economical production on short run jobs. It has one hand valve that operates both vertical and horizontal core box clamps and blows the core in only 3 seconds! The model 55 handles cores up to 4 lbs. and can be used for core boxes with depths up to 10″. A Demmler leader built for profit!



DEMMLER
Core Box Vents

You can depend, too, on Demmler precision core box vents. Brass slotted, steel slotted and screen types in sizes that meet every application.

Wm. Demmler & Bros., Kewanee, Illinois *Write for literature*

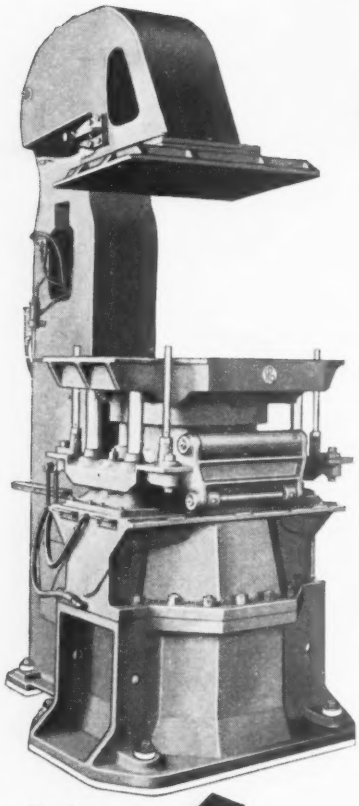
Use

FABREEKA

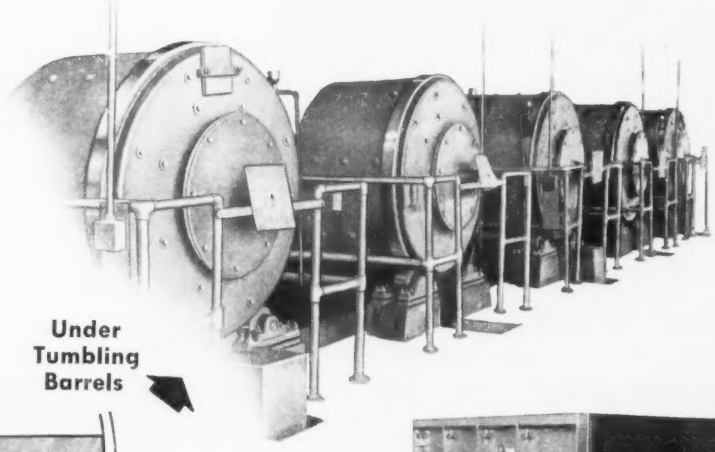
UNDER FOUNDRY EQUIPMENT

TO REDUCE SHOCK, VIBRATION AND MAINTENANCE and to INCREASE PRODUCTION

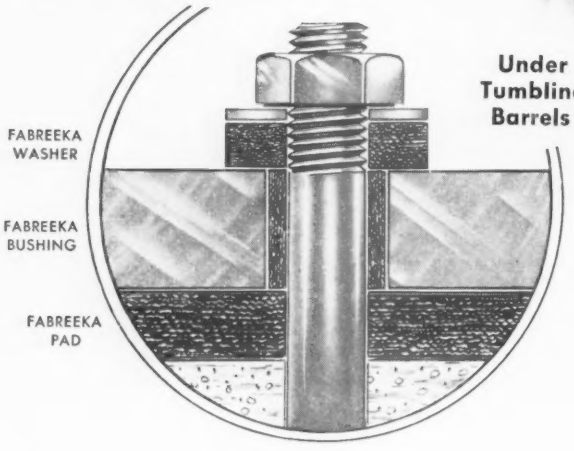
FABREEKA PADS, Bushings and Washers are installed under Molding Machines, Shakeout Machines, Tumbling Barrels and other heavy machinery to reduce the effects of heavy impact shocks and destructive vibration.

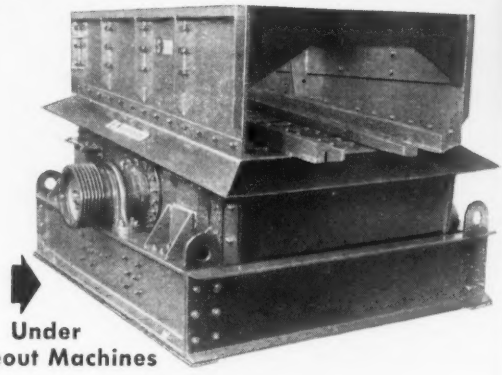


Under Molding Machines



Under Tumbling Barrels





Under Shakeout Machines

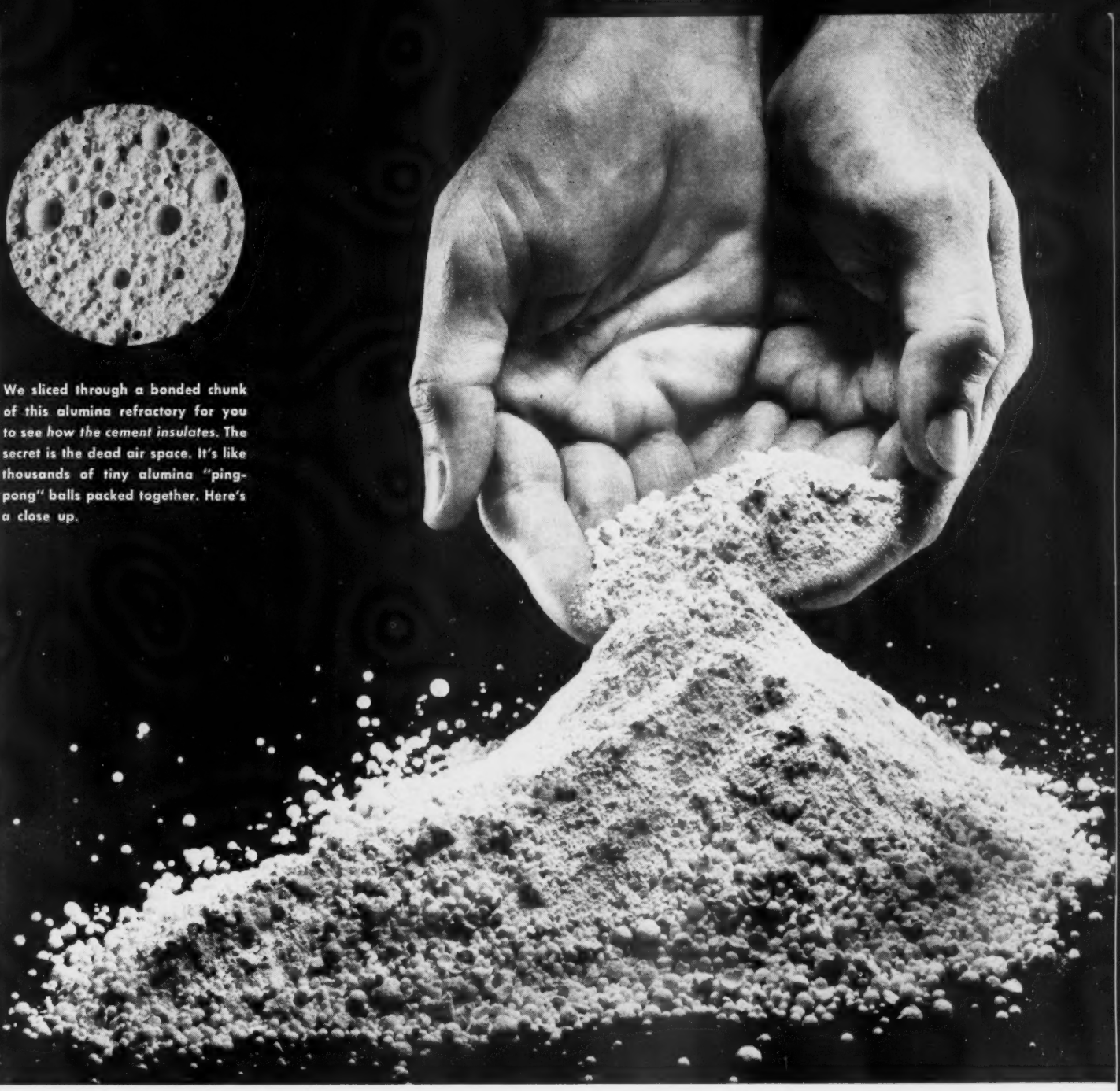
FABREEKA has been used many years for mounting heavy machinery where absorption of impact shock and isolation of transmitted vibration is desired. **FABREEKA** distributes the load properly; prevents cracking and flaking of concrete; eliminates the need for grout; prolongs the life of machines and building.

FABREEKA also reduces noise, helps maintain alignment, reduces maintenance and breakdowns. **FABREEKA** is scientifically constructed to give years of service under the most severe operating conditions.

FABREEKA PRODUCTS COMPANY, INC.

222-B Summer Street, Boston 10, Massachusetts

NEW YORK CHICAGO DETROIT SPARTANBURG PHILADELPHIA PITTSBURGH OAKLAND



We sliced through a bonded chunk of this alumina refractory for you to see *how the cement insulates*. The secret is the dead air space. It's like thousands of tiny alumina "ping-pong" balls packed together. Here's a close up.

These are bubbles of pure alumina and bond. Mix with water and you get a *castable* cement. One that . . .

Stands extreme heat...and insulates

Just mix with water and pour . . . that's all you do to install CARBORUNDUM'S alumina-bubble cements. You can't beat them for convenience and speed. Hardening starts almost immediately after casting.

And when set, these cements stand from 2800 to 3100 F, depending on the type used. Even at these extreme temperatures, they show little or no shrinkage. And since they are made of one of the most stable and inert materials in existence, they are inherently resistant to practically all furnace conditions. They are unaffected by furnace atmospheres . . . combustion gases . . . etc.

These castables also have low heat capacity. Or, expressed another way, they absorb little heat themselves, so permit a furnace to heat up faster. They are as good insulating materials as you can find for really high temperature work.

Possible applications are almost unlimited. You can use them almost anywhere you need a top-quality refractory—and want the convenience of a castable. They make ideal back-up linings for nonferrous melting furnaces, either pit type or tilter. Burner blocks for core ovens, boiler furnaces or malleable annealing furnaces are another possible use. They can be used to back up sidewalls of reverberatory furnaces, etc.

As a starter, send for our free engineering data on castable cements. Or, if you use prefired types of refractory linings—such as one-piece rings, or segments—let us know and we'll send information. But until you've actually checked CARBORUNDUM'S lining materials, you can't fully appreciate how easy they are to install; how long they wear. They'll last years where others last months! *Dept. A-44, Refractories Division, The Carborundum Co., Perth Amboy, N. J.*

CARBORUNDUM

Registered Trade Mark

600 TONS PER HOUR...

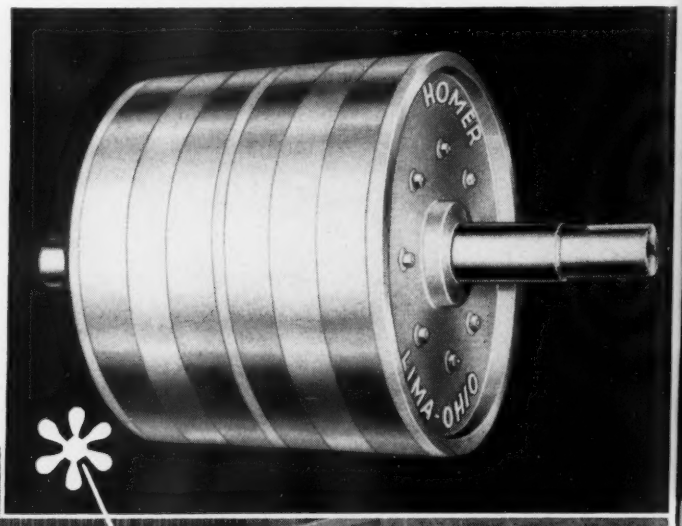
is a tough test- even for *the Best!*

Yes—Homer permanent magnetic pulleys and Homer cross belt magnetic separators are pacing Alcoa's tough conveying and automatic tramp iron removal jobs at their Mobile, Alabama plant.

Lower photo shows Alcoa's 42" x 36" Homer heavy duty permanent magnetic pulley installation, one of the world's largest. This Homer pulley drives the 200' long, 20% troughed slope conveyor, which travels 300 feet per minute, moving bauxite ore at the rate of 600 tons per hour. Slope on the conveyor is 3⅛' per 12' length. This is one of nine Homer magnetic conveyor units installed in this plant.

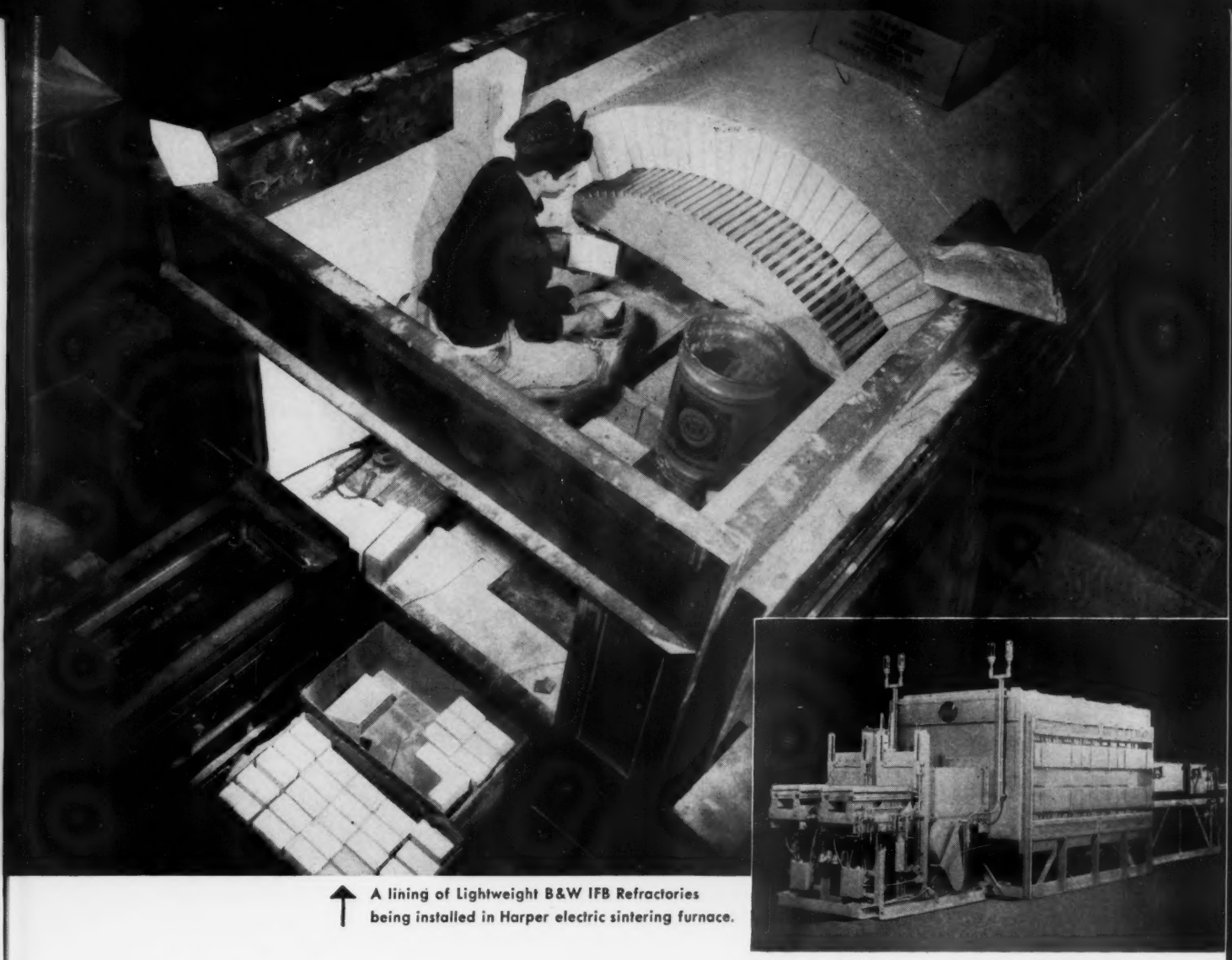
Like ALCOA – HOMER is interested in offering industry only the finest. Homer permanent magnetic separators have proved their ability time after time to perform effectively and efficiently, far beyond normal requirements.

If you are planning to use automatic magnetic separation equipment, it will pay to get the facts on Homer Magnetic Separators . . . the separators designed and built to give years of profitable service under unusual and extreme conditions. Let HOMER help solve your tramp iron problems – write us today. The Homer Manufacturing Co., Inc., Dept. 156 , Lima, Ohio.



Remember... with a HOMER... you are *Certain!*

HOMER



A lining of Lightweight B&W IFB Refractories being installed in Harper electric sintering furnace.

Refractories Maintenance Cut Down

ON HARPER ELECTRIC FURNACES AND KILNS

"Furnace linings that don't last as long as they should can shoot our customers' production costs 'sky high' —and take a big bite out of their profits."

That's one of the reasons why Harper Electric Furnace Corporation standardized on B&W Insulating Firebrick for the electric kilns and furnaces which they manufacture. They know from experience that "B&W IFB last longer than any insulating firebrick we ever tried."

The reason? Volume stable raw materials, unique quality control and manufacturing processes, including B&W's exclusive double burning at temperatures well above use limits—all these factors contribute to more uniform brick and longer life.

B&W IFB, the lightest weight insulating firebrick, also offer these advantages:

Cut electricity or fuel costs— Lighter in weight than any other insulating firebrick, B&W IFB store and conduct less heat. This means faster heating up time, less heat loss during furnace operation. Results? Lower electricity or fuel consumption —often 30% to 50% less than with ordinary heavy firebrick.

Cut installation costs — Hand fitting is easy and fast—B&W IFB can be cut, drilled or shaped on the job with ordinary hand woodworking tools.

Cut down-time — B&W IFB cool off quicker because they store less heat —make possible quick access to the furnace for inspection. Furnace gets back on the line faster, too, because B&W IFB heat up quickly.

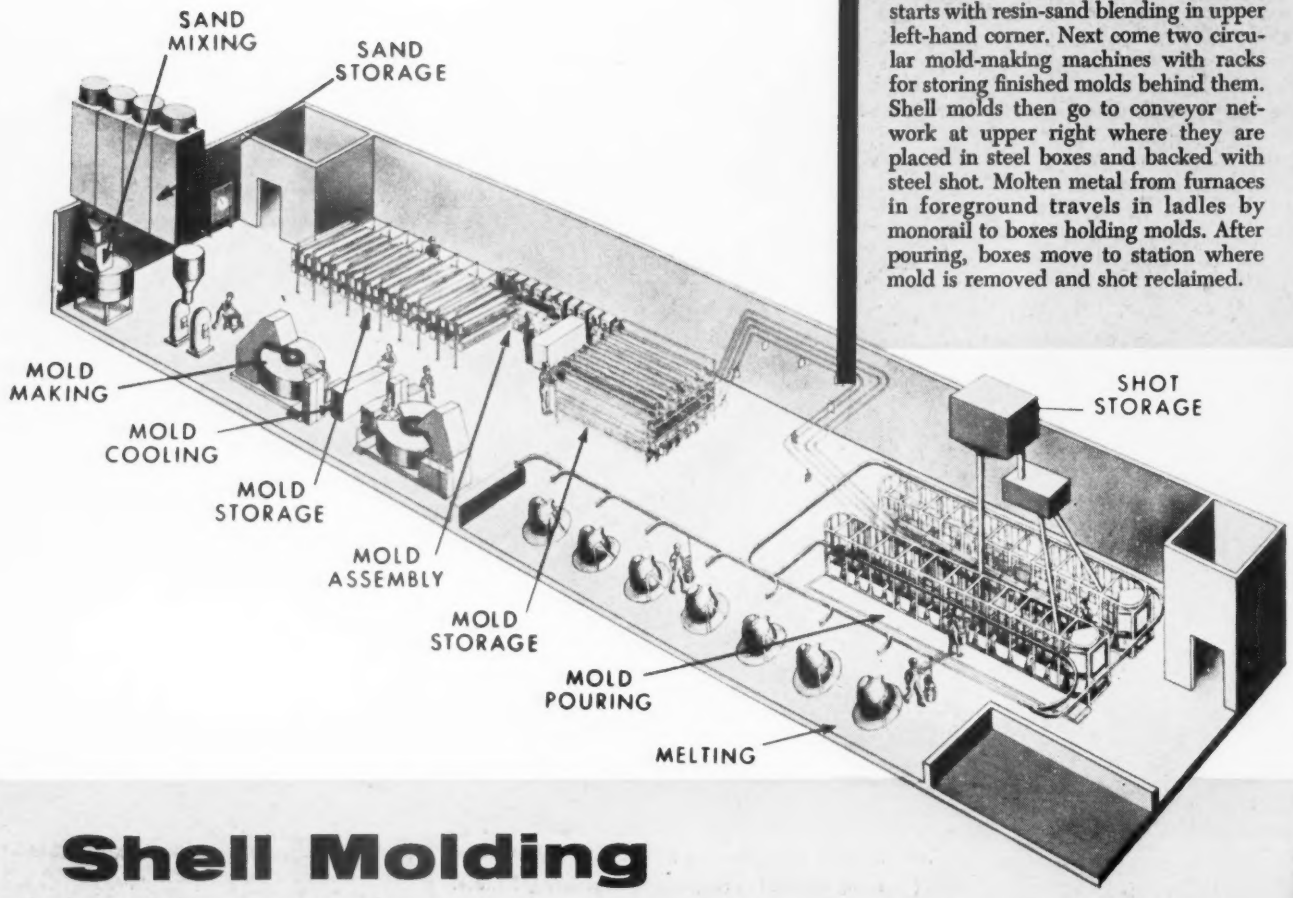
These savings explain why B&W Insulating Firebrick are being used in thousands of applications . . . from the largest industrial furnaces to the smallest kilns. Contact your local B&W Refractories Engineer. He may point the way to new savings in your furnace.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

B&W REFRACTORIES PRODUCTS — B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars

R 494



Floor plan of mechanized foundry starts with resin-sand blending in upper left-hand corner. Next come two circular mold-making machines with racks for storing finished molds behind them. Shell molds then go to conveyor network at upper right where they are placed in steel boxes and backed with steel shot. Molten metal from furnaces in foreground travels in ladles by monorail to boxes holding molds. After pouring, boxes move to station where mold is removed and shot reclaimed.

Shell Molding

fully mechanized by Walworth

BAKELITE Phenolic Bonding Resins Contribute To New System's Efficiency

A new fully mechanized shell molding system is offered to the foundry industry by the Walworth Company which developed the automatic machinery and technique. Installed in Walworth's own foundry at Boston, Mass., the system produces 240 shell molds an hour. Result: mass production of valves, threaded pipe fittings, pipe flanges and other products. They can be cast in bronze, brass, stainless steel, and aluminum.

A new rotary mold-making machine is the primary element in the operation. Later steps are handled almost entirely by conveyor systems—mold assembly, backing molds with steel shot, pouring, shakeout to separate molds from castings, and recycling of shot.

Shell molding has all the features to make such foundry mechanization successful. One advantage is the light weight of shell molds; comparable green sand molds could weigh 20 times as much. Walworth's thin shell molds, made of fine-grained sands bonded with BAKELITE *Phenolic Resins*, weigh 10 lbs. at most. This cuts worker fatigue and makes mold handling faster.

The thin layer of sand bonded with BAKELITE *Phenolic Resins* produces shell molds with surfaces almost pattern-smooth and tolerances as close as .003 to .005 in. per in. Their porosity permits the escape of gases, cutting down rejects. The molds can be stored for months and used as required, giving foundry operations more flexibility in production scheduling.

Perhaps your foundry operations could be improved by the use of shell molds made with BAKELITE *Phenolic Resins*. For information and engineering assistance, write Dept. UQ-29.

BAKELITE
TRADE-MARK

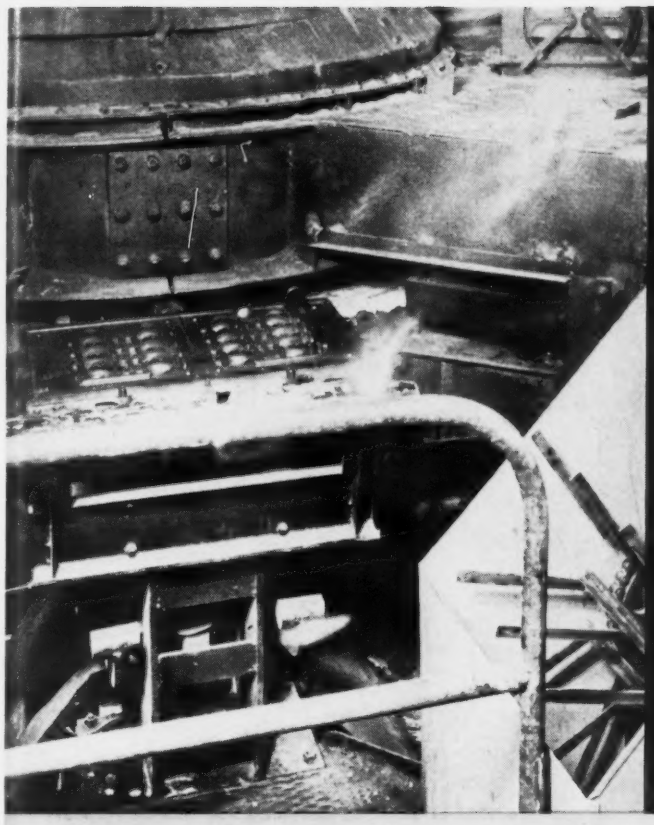
PHENOLIC RESINS for Shell Molding

TRADE (B) MARK

Be sure to visit Bakelite's exhibit, Foundry Show, Cleveland, Ohio, May 8-14

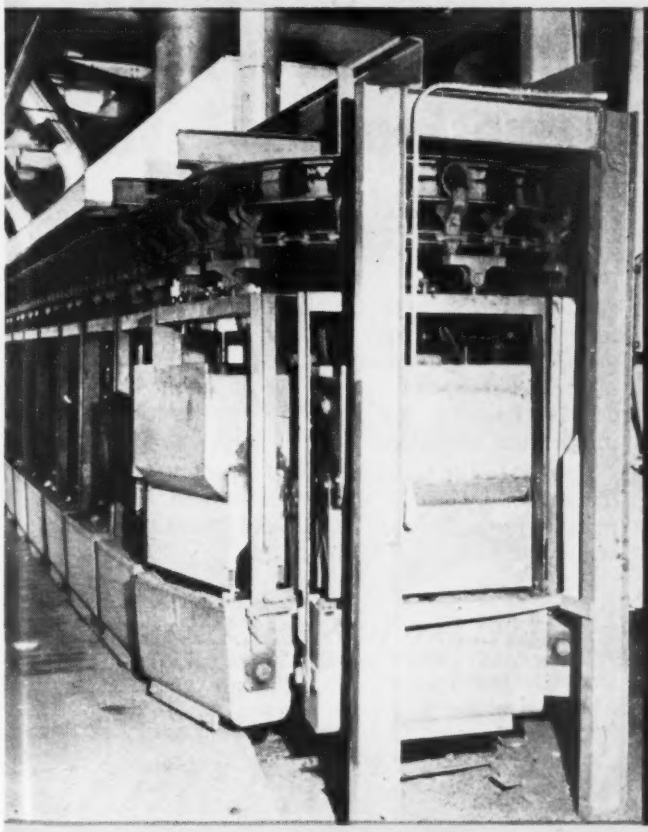
BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

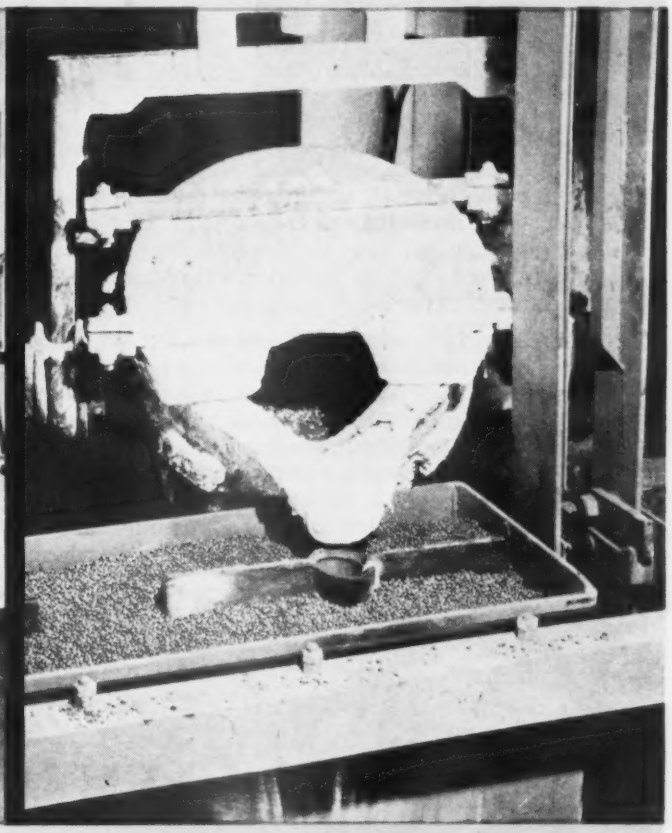


1. Final step in mold making takes place at this station on Walworth machine, where hot pattern is shown just after ejection of cured mold half. Chain-driven rack at right takes molds through cooling chamber.

2. Mold closing machine automatically applies uniform pressure completely joining mold halves after they have been coated with adhesive and cores inserted. Next they go to storage racks or pouring machine.



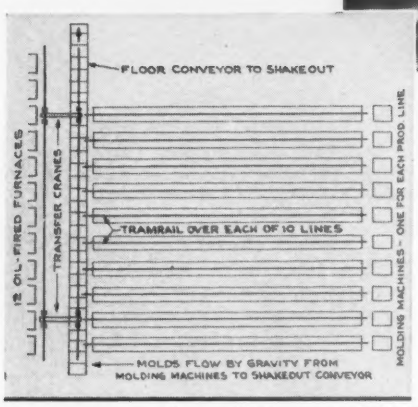
3. Steel boxes containing assembled shell molds travel along this monorail conveyor, where pouring takes place. Boxes in foreground are being filled with steel shot to support assembled shell molds, already in position.



4. Metal is poured when molds backed by steel shot move under ladle brought by monorail from furnaces. Molds travel six feet per minute. After pouring, they move to station where mold, casting, and shot are separated.

This installation is at CRANE LIMITED, Montreal, P. Q.

This transfer crane interlocks with any of the 10 tracks over the conveyor lines enabling fast direct delivery of metal from any of the 12 oil-fired furnaces to any mold on any line.


FLOOR CONVEYOR TO SHAKEOUT
12 OIL-FIRED FURNACES
TRANSFER CRANES
TRAMRAIL OVER EACH OF 10 LINES
MOLDING MACHINES - ONE FOR EACH PROD. LINE
MOLDS FLOW BY GRAVITY FROM MOLDING MACHINES TO SHAKEOUT CONVEYOR

16 tons of small brass fittings are poured in a 9 hour day with this hand-propelled Cleveland Tramrail equipment. Hoists are electric of 1000 lb. capacity.

Speeds Brass Fitting Production With Continuous Straight-Line Foundry Layout

Because of an efficient straight-line production layout, small brass fittings are made in large quantities at minimum cost in the foundry of Crane Limited, Montreal. The arrangement reduces manual handling to the least possible.

There are 10 production lines, each of which is served by a molding machine. The molds ride on dollies that travel down the lines by gravity. Over every line is a Tramrail track on which hot metal is conveyed directly to the molds from the furnaces. After a line has been poured, the molds are permitted to advance to the end of the line where a mechanism dumps the sand and castings onto a continuous conveyor, set flush with floor, which serves all 10 lines and carries the materials to shake-out. Empty dollies are returned to molder at opposite end via a track on lower deck of production line.

The foundry is in continuous operation. Every man is kept busy at his particular job. No time is lost shifting from one operation to another. Because of the flexibility of Tramrail equipment hot metal can be delivered quickly from any furnace to any mold, thus metal heat loss is kept low.

Look into the possibilities of boosting your foundry efficiency with Cleveland Tramrail. A qualified engineer will be glad to discuss foundry handling with you without obligation.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3836 East 286th St., Wickliffe, Ohio.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

know your distributor, he knows the best products for you

His job is to help you produce better castings every time. Call on him for all your foundry needs.

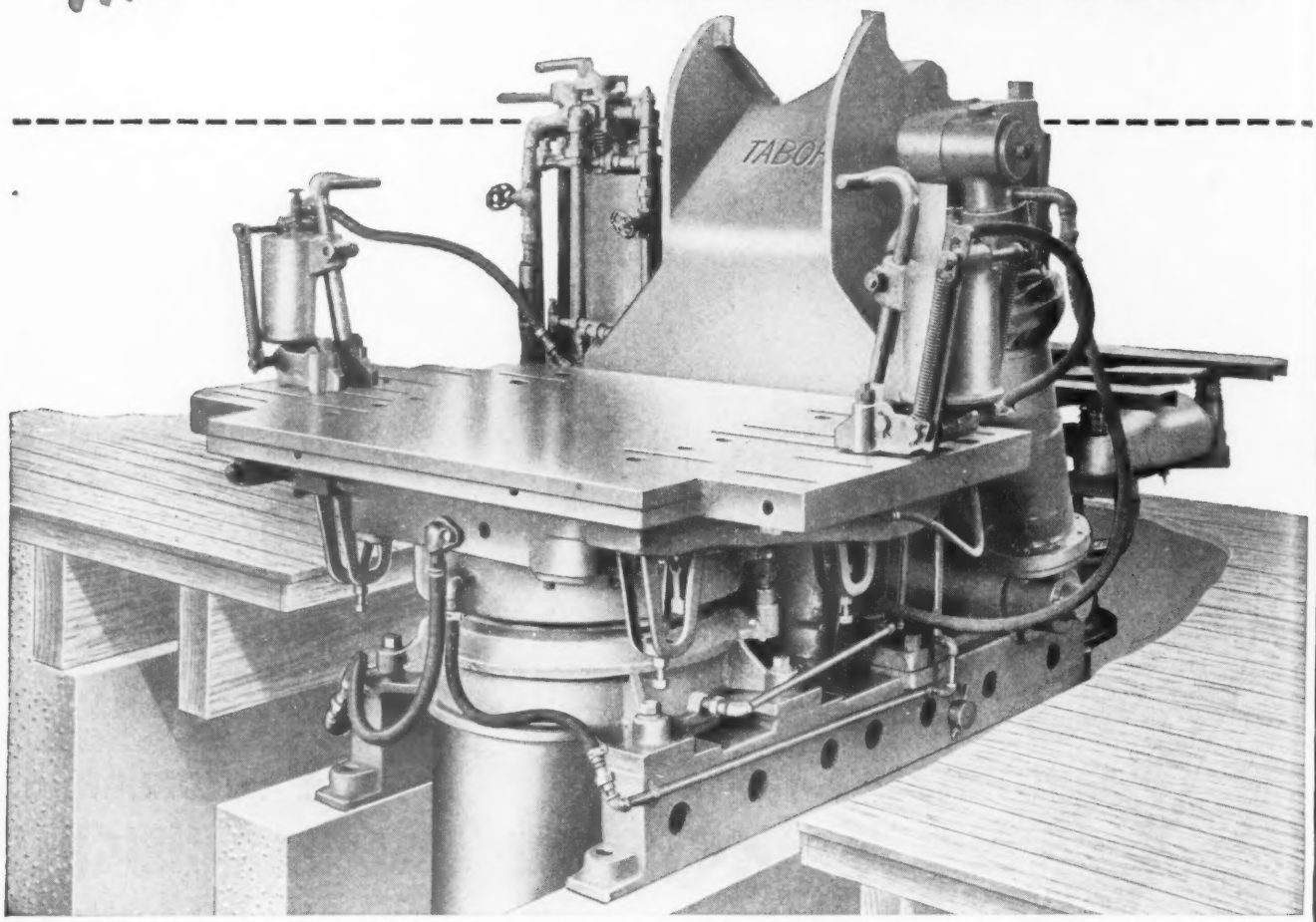
He recommends CEDAR HEIGHTS CLAY PRODUCTS

From the deep deposits in Southern Ohio comes the bonding clay that foundrymen depend on . . . Cedar Heights Bonding Clay. High refractory value, high plasticity, and unusually high sintering point of 2675° to 2725° F. are qualities that will help you produce superior castings consistently. Cedar Heights' modern equipment and complete laboratory control give absolute uniformity in every pound, assuring high green strength and low contraction. For a dependable plastic bonding agent, insist on low-cost Cedar Heights Bonding Clay . . . Southern Ohio's best!
Call your distributor now for a free sample or write direct.

EVERY STEP QUALITY-CONTROLLED ...SINCE 1924

CEDAR HEIGHTS CLAY 50 PORTSMOUTH ROAD OAK HILL, OHIO **COMPANY**

There's A TABOR ROLLOVER TO FIT THE JOB!



PICTURED is only one of Tabor's large and diversified family of foundry-proved Rollovers. This one's a 3,000-lb. capacity, *shockless* job. The rollover plate is 40" wide x 50" long. When air-operated flask clamps are used (as shown), it handles pattern boards ranging in length from 24" to 56". Even with modest pit requirements, the plate is only 15" above floor level for easy workability. Accommodates a 43" deep flask (including pattern board and bottom boards)—minus the draw required. Maximum draw on the unit shown is 15". With modifications we can provide for a 55" flask depth on the basis outlined above, and a 20" draw.

Tabor Power Rollovers run the gamut of size and type. They range from 450-lb. to 3,000-lb. capacity. All are *completely* power-operated and can be furnished with air-operated flask clamps. You can choose between plain or shockless jar, and some types are portable. All incorporate Tabor's famous air-on-oil principle for a perfect draw. All perform up to full rated capacity, completing a cycle of operations in the fractional part of a minute.

Complete Rollover family is presented in Bulletin #534—just off press. Write for your copy. Then team up with Tabor for a quick and satisfactory solution to any Rollover problem.

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif., The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H Reich, Trussville, Ala

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

EXPORT DEPARTMENT, 765 DREXEL BLDG., PHILA. 6, PA.

Dear Reader:

This page has been provided for your convenience. Use one of the return cards attached for *more information* on advertisements in this issue.

FURTHER INFORMATION on any of the advertisements in this issue may be obtained by circling the page numbers of advertisements on one of the attached cards. Fill in your name and address, return your card to us—we'll forward your requests to the companies concerned. Further information on their advertisement will come direct to you from the advertiser. *Note: where more than one advertisement appears on a page, the following code is used for identification:* R (right); L (left); T (top); B (bottom); 1-2-3-4 (in order from top to bottom); IFC (inside front cover); IBC (inside back cover); OBC (outside back cover).

● For further information on helpful literature, trade publications, and new equipment descriptions, please refer to IDEAS FOR FOUNDRYMEN insert and return cards on page 235.

FOUNDRY Readers Service

FIRST CLASS
PERMIT No. 36
(Sec. 34.9 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio

Readers Service Dept.

APRIL 1954

IFC	32	65	93	168-9	225	258	275L	285TL
1	35	66	94	171	228-9	259	276T	285BL
2	36-37	69	95	174	232	260L	276B	286TL
4-5	38	70	96	176-7	237	260R	277	286BL
6-7	39	71	97	179	238	261	278T	286R1
8	40-41	72	98	180	239	262T	278B	286R2
9	42	73	99	182-3	240	262B	279R	286R3
10	43	74	100	187	241	263R	280L	286R4
11	44-45	75	133	189	242	263L	280TR	286R5
12	46	76	135	190	245	264L	280BR	287T
13	47	77	136	192	244	264R	281R	287BR
14	48	78	138-9	195	245	265T	281TL	287BL
15	49	79	141	197	246	265B	281BL	288TL
16-17	50-51	80	143	199	247	266T	282TL	289BL
18	52	81	145	200	248	266B	282BL	288R1
19	53	82	146	203	249	267R	282TR	288R2
20	54	83	148-9	205	250	267L	282BR	288R3
21	55	84	151	207	251	268T	283R	288R4
22-23	56	85	152	209	252	268B	283TL	288R5
24	57	86	155	211	253	271	284L1	289R
25	58	87	157	213	254	272L	284L2	289TL
26	59	88	158	214	255	272R	284R1	290T
27	60	99	161	216-7	256T	273T	284R2	298
28	61	90	163	219	256B	273B	284R3	302
29	62-63	91	165	221	257R	274	284B	IBC
30-31	64	92	166	223	257L	275R	285R	OBC

THIS CARD VALID FOR USE IN UNITED STATES AND CANADA ONLY

PLEASE SEND further information on the advertisements appearing on the pages which are circled above.

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY & STATE _____

This card MUST be completely filled out. Please TYPE or PRINT

APRIL 1954

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6-7	39	71	97	179	238	261	278T	286R1
8	40-41	72	98	180	239	262T	278B	286R2
9	42	73	99	182-3	240	262B	279R	286R3
10	43	74	100	187	241	263R	280L	286R4
11	44-45	75	133	189	242	263L	280TR	286R5
12	46	76	135	190	243	264L	280BR	287T
13	47	77	136	192	244	264R	281R	287BR
14	48	78	138-9	195	245	265T	281TL	287BL
15	49	79	141	197	246	265B	281BL	288TL
16-17	50-51	80	143	199	247	266T	282TL	288BL
18	52	81	145	200	249	266B	282BL	288R1
19	53	82	146	203	249	267R	282TR	288R2
20	54	83	148-9	205	250	267L	282BR	288R3
21	55	84	151	207	251	268T	283R	288R4
22-23	56	85	152	209	252	268B	283TL	288R5
24	57	86	155	211	253	271	284L1	289R
25	58	87	157	213	254	272L	284L2	289TL
26	59	88	158	214	255	272R	284R1	290T
27	60	89	161	216-7	256T	273T	284R2	298
28	61	90	163	219	256B	273B	284R3	302
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FIRST CLASS
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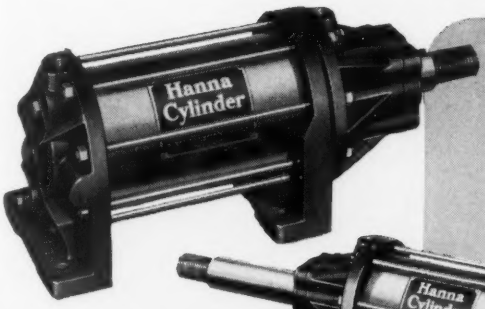
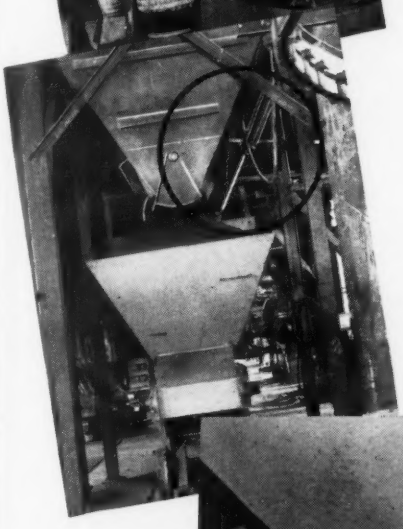
FOUNDRY Readers Service

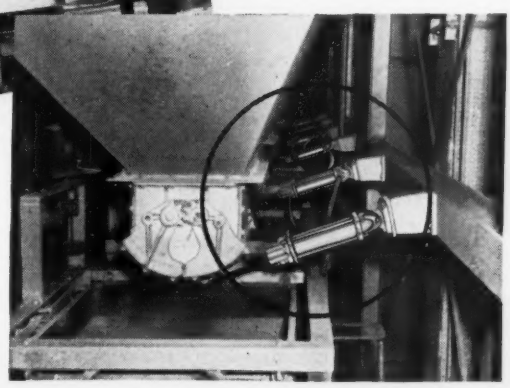
Here's Tireless, Low-Cost Power

FOR 1001 JOBS IN YOUR PLANT



Hanna® *Air* Cylinders





...LIKE PUTTING MORE "HOP" IN YOUR HOPPER GATES

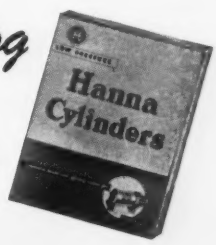
Hanna Cylinders are serving men and machines in all types of industries throughout the country — providing *smooth, safe, dependable* power in 1001 ways. They simplify the actuation and control of machines and equipment involving a push, pull or lift movement.

For example, what could be more simple, direct and dependable for opening and closing hopper gates? Whether operated manually with Hanna Unitite Valves or by remote control with Hanna momentary Solenoid Valves, Hanna Air Cylinders are the economical, efficient answer to problems of this type.

In the machines you build, or in the equipment in your plant, there are many applications where Air Cylinder Power can be used to advantage. Hanna Engineers will be glad to work with you in applying Cylinder Power to your problems.

Send for Catalog

New Hanna Low Pressure Cylinder Catalog No. 236 contains valuable information. Send for your copy.



Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1772 Elston Avenue, Chicago 22, Illinois

TO ALL outward appearances any two grades of shot or grit may appear to be as much alike as peas in a pod—but there the similarity ends. Rarely do they perform alike.

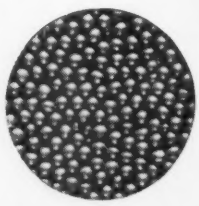
In using HI-GRADE Shot and Grit you'll find there IS a difference . . . a recognizable value far beyond purchase price that shows up in extra performance on the job.

Though you may be satisfied with the material you are now using, it is just good business not to deny the promise of uniform, lower cost, more efficient blast-cleaning which HI-GRADE Shot and Grit can fulfill for you.

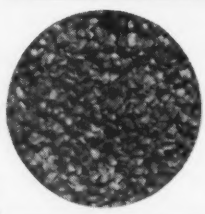
You can't be blamed for wanting longer use-life in the abrasives you use—more efficient cleaning and peening—a better finish in less time. Get these advantages with HI-GRADE Shot and Grit. Requisition a trial quantity today. You'll never regret it.

Packed in 100 lb. Bags—Ready for Immediate Shipment

METALLIC
SHOT HI-GRADE GRIT



HI-GRADE SHOT
UNIFORM SIZE AND HARDNESS
Withstands repeated strain, stress and wear. Exclusive alloying and tempering process helps prevent rust; minimizes impact fractures.



HI-GRADE GRIT
SHARP, TOUGH AND DURABLE
Made of same material and processed by same methods as Hi-Grade Shot. Cleans with maximum efficiency. Reduces equipment wear and maintenance costs.

HI-GRADE SHOT AND GRIT MORE THAN MEETS S.A.E. SPECIFICATIONS—SCREENED AND GRADED FOR 100% USAGE

Clayton-Sherman *Abrasives Company*

MANUFACTURERS OF *QUALITY-CONTROLLED* SHOT AND GRIT

Representatives in Principal Cities

3896 LONYO ROAD ★ DETROIT 10, MICHIGAN

2 New fine FANNER CHILLS

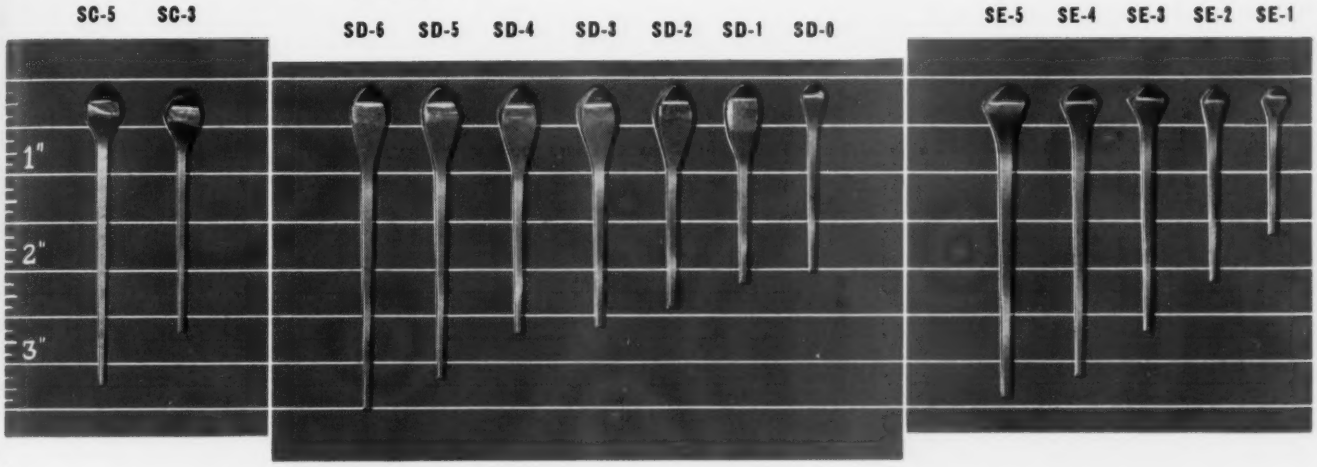
that improve casting quality . . . cut costs

• Since the introduction of these two new fine FANNER CHILLS a short time ago, the demand for additional types was so great, that several new types have been produced. Here for the first time you see the complete line of fine FANNER Superchillet and Fanchillet Chills. Each will result in better, sounder castings when used for its particular purpose.

fine FANNER Superchillet Chills

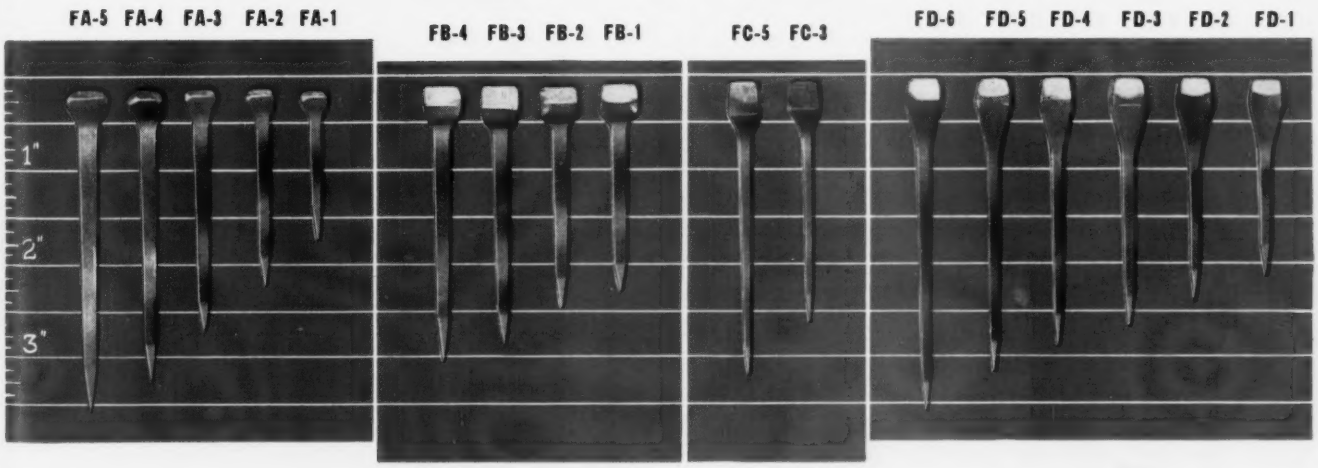
(patented)

• Superior in the pouring operation. Surfaces are correctly tapered so that gases, as fast as generated, are free to flow along surfaces without "pocketing." No sharp shoulders . . . more chilling volume per pound . . . better surfaces for molten metal to contact.



fine FANNER Fanchillet Chills

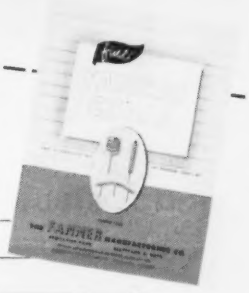
• Instead of conventional square head, the Fanchillet Chill has its sides tapered toward the top. Gases are free to flow along surfaces without "pocketing" . . . molten metal completely envelopes head. Costs less per pound than price per pound for which you sell finished casting.



• These scientifically engineered fine FANNER chills result in better, sounder castings every time. They are not "off-shoots" or by-products but are designed to produce proper chilling at lowest cost without "blows" . . . without "kicking away" . . . without defects caused by ordinary chills. SUPERCHILLET CHILLS and FANCHILLET CHILLS are available in the wide range of sizes and shapes shown above. Write for samples and prices. For other types of chills, also ask for FANNER Chill Catalog.

THE FANNER MANUFACTURING CO.
BROOKSIDE PARK CLEVELAND 9, OHIO
designers and manufacturers of Fine FANNER Chills

Send prices and samples
☐ SUPERCHILLET CHILLS
☐ FANCHILLET CHILLS
☐ Send Fanner Chill Catalog
FIRM_____
BY_____
ADDRESS_____
CITY & STATE_____

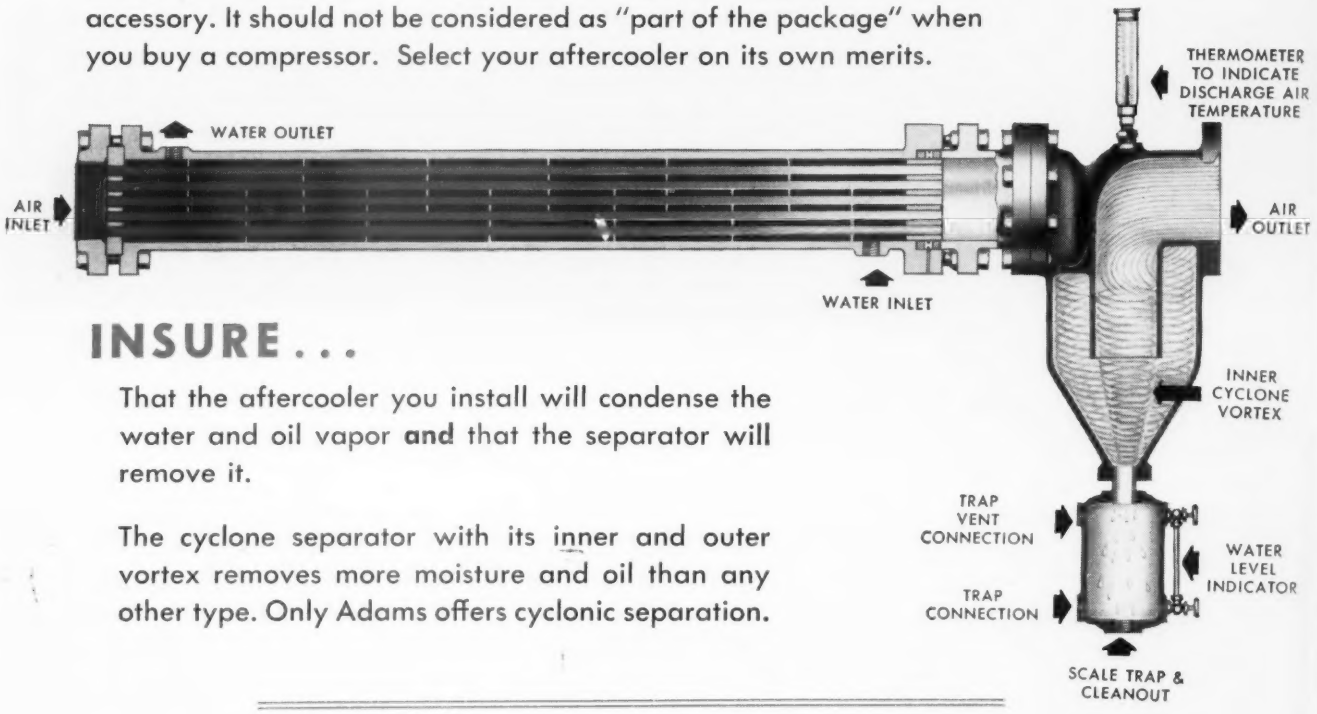


LOSING MONEY ON WET, DIRTY AIR?

Rx...SEE A SPECIALIST!

Removal of moisture from compressed air is a problem entirely independent from the type of compressor used. It is a problem for **specialists** in the design and manufacture of aftercoolers. Specialists for nearly two decades, the R. P. Adams Co. has built a solid reputation on the aftercooler and cyclone separator that are chosen throughout industry for better performance, price and delivery.

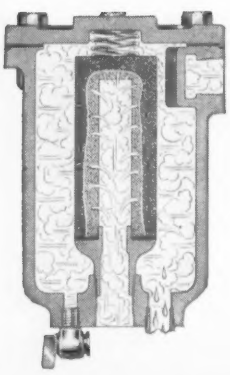
The aftercooler you install to protect air operated equipment is not an accessory. It should not be considered as "part of the package" when you buy a compressor. Select your aftercooler on its own merits.



INSURE...

That the aftercooler you install will condense the water and oil vapor **and** that the separator will remove it.

The cyclone separator with its inner and outer vortex removes more moisture and oil than any other type. Only Adams offers cyclonic separation.



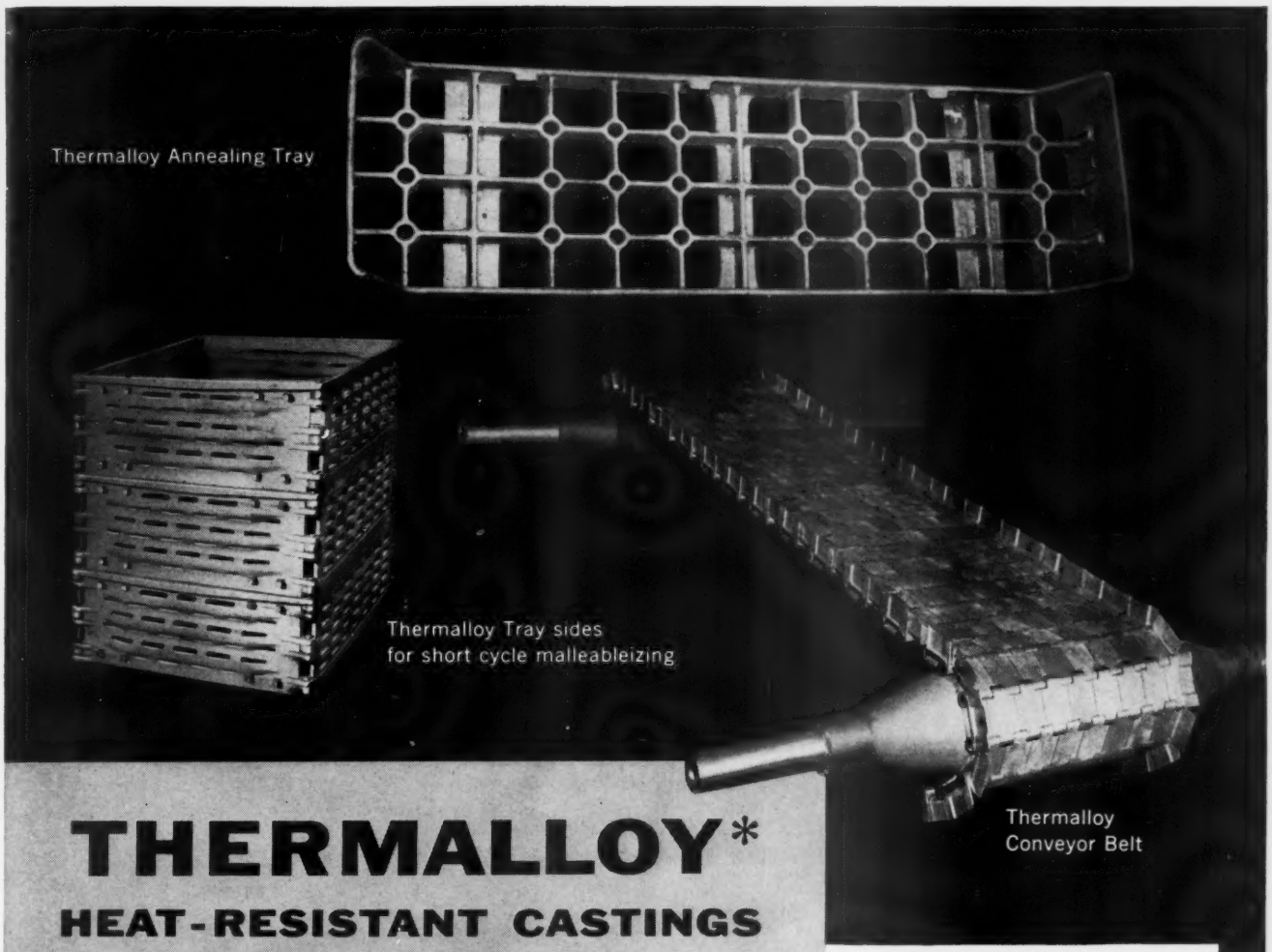
ADAMS PORO-STONE AIR FILTER

Why Adams Poro-Stone Air Filters are Famous

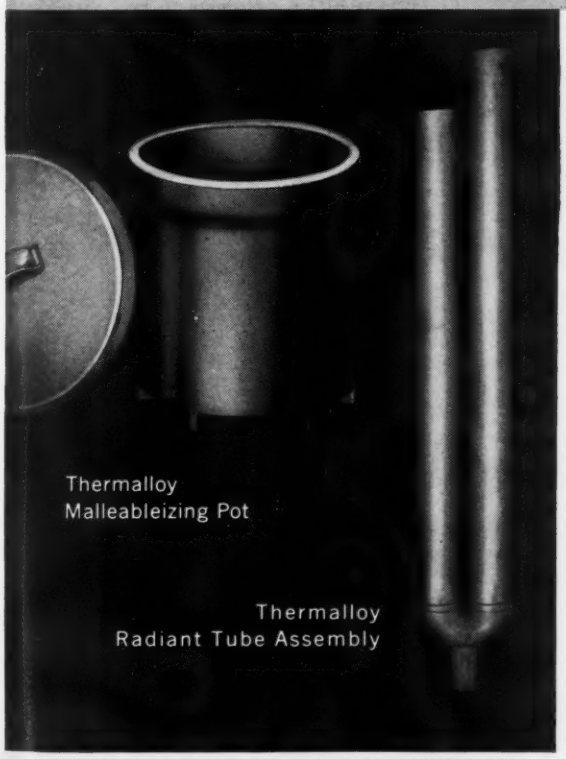
1. Rapid diffusion and filtration through permanent, cleanable Poro-Stone.
2. Centrifugal separation of dirt and liquids.
3. Drainage to trap directed by cast-in slots.
4. Continuous, fully automatic trap action.
5. Easily installed in vertical or horizontal pipeline.
6. Less than ½ lb. pressure loss at rated capacity.

SEND FOR BULLETIN 177 TO:

R. P. ADAMS CO., INC. 226 EAST PARK DRIVE BUFFALO 17, N. Y.



THERMALLOY*
HEAT-RESISTANT CASTINGS



Can help cut heat-treat costs

Here are a few of the many high heat-resistant Thermalloy castings that can help you cut heat-treat costs. Whether it's a standard tray, basket, pot or radiant tubes . . . or a specially-designed unit or furnace part . . . investigate Thermalloy's heat and abrasion-resistant properties.

Thermalloy is a group of tough, heat-resistant alloys specifically developed to take heavy loads and rough usage . . . to resist corrosive gases, excessive heat (up to 2100°F.) and abrasion.

At Electro-Alloys, a competent engineering and metallurgical staff will be glad to help you utilize Thermalloy castings to best advantage in your plant. Call your nearest Electro-Alloys Office or write Electro-Alloys Division, 5008 Taylor Street, Elyria, Ohio, for complete information available in Thermalloy Bulletin T-225.

*Reg. U. S. Pat. Off.

AMERICAN Brake Shoe COMPANY

ELECTRO-ALLOYS DIVISION
ELYRIA, OHIO

Naturally we are well satisfied with our LANLY OVEN

says Mr. R. R. MILLER, *President*
Precision Metalsmiths, Inc.
CLEVELAND 17, OHIO

SIMPLIFYING MANUFACTURERS PROBLEMS is their SPECIALTY...

Supplying precision castings of single components or complete assemblies . . . ranging in weight from a fraction of an ounce to over several pounds in unlimited quantities of ferrous and non-ferrous alloys.

Just a few of these "cast masterpieces" are shown here. As Mr. Miller states, his LANLY OVEN is responsible in no small way for the consistent, excellent results obtained on a "round the clock" production schedule.

Precision Metalsmiths, Inc.
PRECISION INVESTMENT CASTINGS • FERROUS & NON-FERROUS
CONSULTATION • RESEARCH • DEVELOPMENT
1081 East 200th Street · Cleveland 17, Ohio
Telephone: IVanhoe 1-6900

February 23, 1954.

The Lanly Co.
750 Prospect Avenue,
Cleveland 15, Ohio.

Gentlemen:

We thought you might be interested in receiving our comments on the Lanly Mold Curing and Wax Reclaiming oven purchased from you in February, 1952.

This oven is certainly well engineered as it has been in constant operation from the date of installation without any down-time due to failures of any nature.

We maintain a 210° temperature for curing invested molds. These molds have considerable water and wax in them. Between 6-8 hours is required for curing.

Previously in another type of oven it took between 24-30 hours for the same operation!

In short, we have had uninterupted performance on a 24 hour production basis from our Lanly and naturally are well satisfied.

Very truly yours,

PRECISION METALSMITHS, INC.,

R.R.MILLER,
President.

RRM:rg.

YOU TOO, CAN DO A BETTER JOB WITH LANLY OVENS

Write Today for Details and Let Us Show You How!

LANLY FOUNDRY OVENS
THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO

DEMING solves a tough pumping problem at UNITED NATIONS

AIR conditioning the United Nations Building in New York City posed a tough pumping problem. It was solved by the use of Deming Vertical Turbine Pumps, which move water from the East River, through filtering screens of the air conditioning system.

To withstand rigid service conditions like this, The Deming Co., Salem, Ohio, manufacturer of the pumps, requires cast parts of exceptionally high quality and close grain. To meet those requirements, and the special requirements of Deming pumps in many other industrial, commercial and agricultural applications, the company regularly uses NEVILLE Pig Iron in its gray iron production. ● Why not call on NEVILLE Pig Iron to help you solve *your* special casting problems.

NEVILLE
Quality Pig Iron for the Foundry Trade

W&D 5110

PIG IRON DIVISION
PITTSBURGH COKE & CHEMICAL CO.
Grant Building • Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Stretch

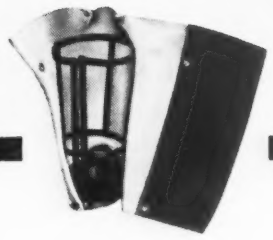
Your Legging Money

Farther with the

NEW

AO 1512R-CL LEGGING

with Replaceable Fabric or Frame



COVERING OR SPRING MAY BE REPLACED SEPARATELY!

You put your best foot forward financially when you choose this spring type legging to protect your worker's legs and ankles. Why? Because both the frame and fabric are removable and replaceable. Should either the frame or the fabric become unusable, either can be replaced. This feature is a great advantage over most leggings from a cost standpoint; yet the worker's safety and protection have in no way been minimized.

This very serviceable legging is available in chrome-tanned cowhide as the 1512R-CL . . . in asbestos as the 1481R-A . . . in flame-resisting duck as the 1482R-FR. Your AO Safety Products Representative can supply you with this highly serviceable protection.

NOTE: We recommend AO chrome-tanned cowhide or asbestos for protection against heat, sparks, and hot metal splashes. AO flame-resisting duck will do a fine protective job against sparks.

American Optical

SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

AO SAFETY ZONE

Keep your workers in the Safety Zone with AO Safety Equipment

This metal will be
ROCKED and SPUN
to make a better casting

Detroit Electric Furnaces melt both ferrous and nonferrous alloys at Shenango's Centrifugal Casting Division, Dover, Ohio.

Six Detroit Rocking Electric Furnaces melt alloys for huge centrifugally cast sleeves, rings and fabric rolls at Shenango-Penn Mold Company. These fast melting Detroit Furnaces achieve the close control of temperature and metal analysis required, producing better centrifugal castings with fewer rejects.

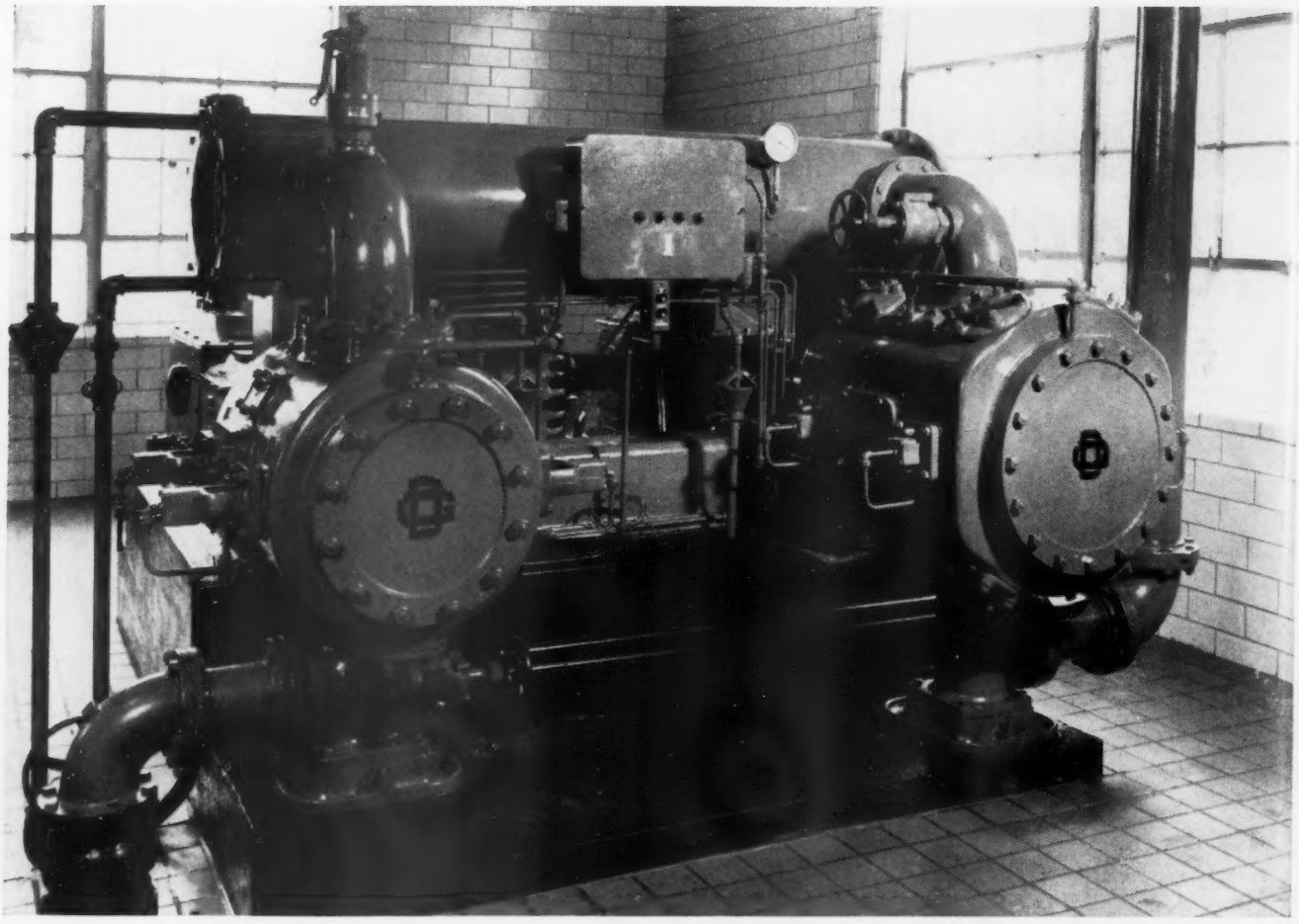
Indirect arc melting and controlled rocking action produce finer, more uniform melt results. Electrodes are always clear of the molten metal, holding alloy variation and carbon pickup to a minimum. Rocking action assures homogeniety of the metal and washes it over more refractory surface for greater heat utilization, longer refractory life.

The versatile Detroit Rocking Electric Furnace melts ferrous or nonferrous metals with speed and economy. Send us your melting requirements and our engineers will show you how "Detroit's" can do a better melting job for you. Write today!

DETROIT ELECTRIC FURNACE DIVISION

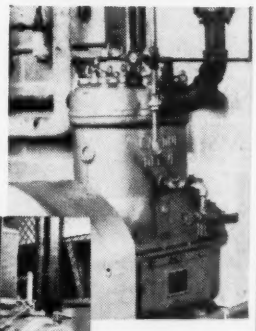
Kuhlman Electric Company • Bay City, Michigan

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi inc., 150 Broadway, New York 7, N.Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.



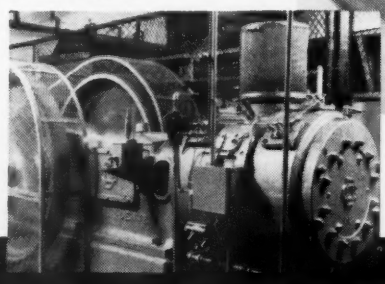
Model HA—468 to 1854 cfm—Bulletin HAC-36

Model AA—32 to 183.6 cfm—Bulletin AA-5



Cutting overhead down to size?

Model RX—89 to 1292 cfm—Bulletin HAC-40

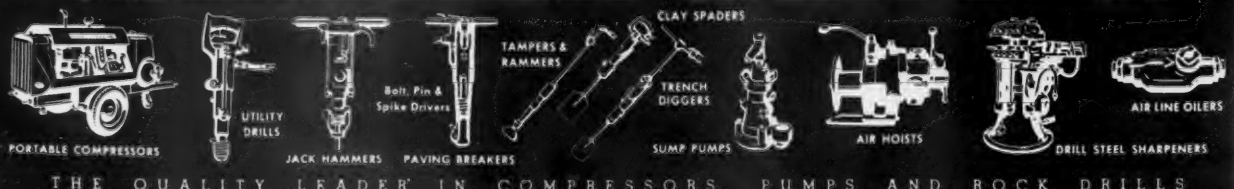


A new Gardner-Denver in your compressor room can eliminate a big part of your air compressor maintenance—may reduce operating costs as well.

Let us tell you about a recent installation which is actually saving thousands of dollars per year.

SINCE 1859

GARDNER-DENVER



THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd. 14 Curity Avenue, Toronto 13, Ontario

WEIGHS 28 LB

LIFTS 1,000!

KELLER AIR HOISTS

Lightness in weight is an advantage you get when you LIFT WITH AIR. One man easily carries a Keller Air Hoist up a ladder and hangs it . . . thus it is easy to move from place to place in the shop, and to service.

POSITIVE CONTROL OF THE LOAD—The Keller Air Hoist operates with an air valve, so it has an infinite number of speeds from the merest "nudge" to 17 fpm. Spotting is easy and accurate with the positive displacement motor and mechanical brake that locks the load in place.

LOWER MAINTENANCE COSTS—An air motor cannot burn out—from overload, stalling, continuous use, or too frequent reversals. Thus the use of air hoists usually brings a substantial reduction in down time and expense.

Available in 3 capacities—300, 1,000, and 2,000 lb. For full information, ask for Catalog Section 86.

KELLER TOOL COMPANY

1323 Fulton St., Grand Haven, Mich.

"I'll get to BUFFALO ANY WAY

...to get those BETTER BUFFALO PATTERNS"

Foundry men that know their stuff,
Say Buffalo Patterns save enough,
To always make it worth their while,
To come to Buffalo ANY style.

Our Engineers so thoroughly plan,
Details of every job at hand,
And Craftsmanship that's superfine
Produces patterns so sublime.

When our equipments you install,
You'll find they're really "on the ball,"
No extra rigging need you do,
And with adapting you are through.

In your foundry our work will FIT,
And production schedules never slip,
Scrap ratios hit an all time low,
With these BETTER patterns from Buffalo.

Production and Experimental Pattern Equipment • Shell Mold Pattern Equipment and Engineering • Wood and Plastic Models • Jigs, Templates and Target Fixtures • Permanent Molds • Forging and Stamping Dies • Dies for Injection and Reinforced Plastics Molding • Special Precision Parts • Special Machinery and Tooling • Metallizing • Engineering Drawing Service

Be our guest Just let us know when you are coming to Buffalo on pattern business. One of our cars will meet you at your plane or train and transport you to our club where you will be our guest during your stay.

BUFFALO PATTERN WORKS, INC.

832 HERTEL AVE., BUFFALO 16, N. Y.

DESIGNERS AND MANUFACTURERS OF PATTERN EQUIPMENT FOR OVER HALF A CENTURY

BS&B "PERFECTION" FOUNDRY FLASKS

. . . Are First Choice with
THE BULLARD COMPANY!
...Leading Manufacturer of
Precision Machine Tools...

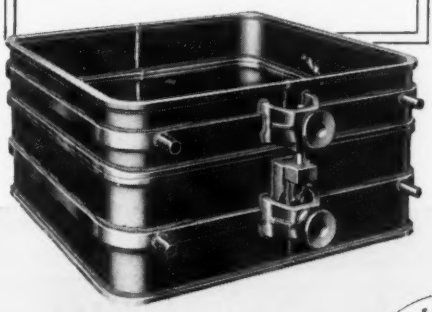
The Bullard Company of Bridgeport, Conn., is known the world over as one of this country's oldest and finest manufacturers of high quality precision machine tools. In their gray iron foundry, which also casts other materials, you'll see row upon row of BS&B "PERFECTION" Foundry Flasks turning out consistently good castings, year in and year out.

Bullard bought their first "PERFECTION" flasks more than 5 years ago, and found them markedly superior in every respect to others they were using. Now, when flasks of any other kind reach the point of replacement, they are replaced with "PERFECTION" flasks exclusively!

Bullard's experience with "PERFECTION" flasks is typical of many of the country's leading foundries . . . Reading Gray Iron Castings, Inc., McNally-Pittsburg, E. L. LeBaron Foundry Co., Westinghouse, Gisholt Machine Co., Prier Brass Mfg. Co., Hartford Electric Steel Co. . . . to mention but a few. These companies know that for every extra penny in cost, "PERFECTION" flasks give many dollars of extra value and service in return.

No Other Foundry Flask Gives You All 4 Features!

1. Continuous welding of bearing strips — inside and out.
2. Cast steel trunions.
3. Cast steel pinlugs and clamplugs.
4. Elimination of corner stresses.



Why not give "PERFECTION" Foundry Flasks a trial in your foundry? Once you try them, you'll always buy them! Let your BS&B Representative give you the facts.

"PERFECTION" *Flasks*

...Designed By Foundrymen For Foundrymen!

EFFICIENCY · OVER 60 YEARS · BS&B · RELIABILITY

BLACK, SIVALLS & BRYSON, INC.

Foundry Flask Division—Dept. 7-AR4
7500 East 12th Street
Kansas City 26, Missouri

COLEMAN OVENS

reduce waste . . .
lower costs

in every type of foundry

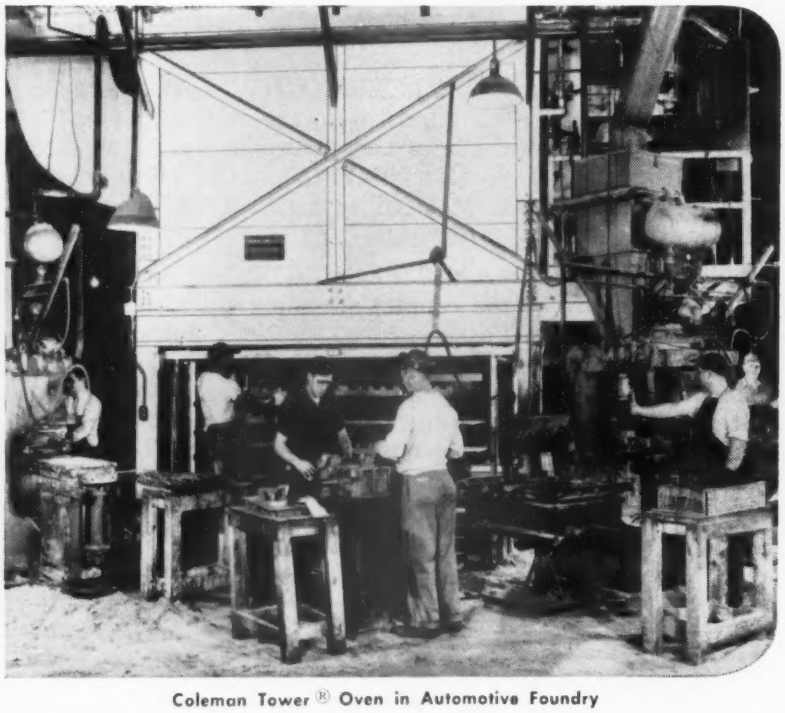
You can reduce casting scrap . . . cut your labor, material and fuel costs by baking cores and drying molds in Coleman Ovens. Small and large foundries alike find that Coleman Ovens are vital to better quality castings and increased profits.

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

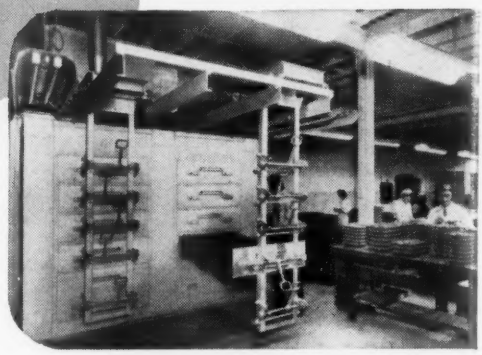
Coleman Engineers have pioneered and developed the most efficient oven designs to meet the highly specialized needs of modern foundry methods in all classes of work — grey iron, malleable, steel, alloy, brass, aluminum and magnesium.

Profit by this experience — let us recommend, at no obligation, the Coleman Oven for your needs.

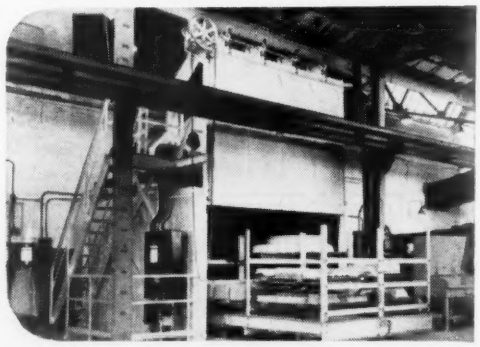
Write for Bulletin D



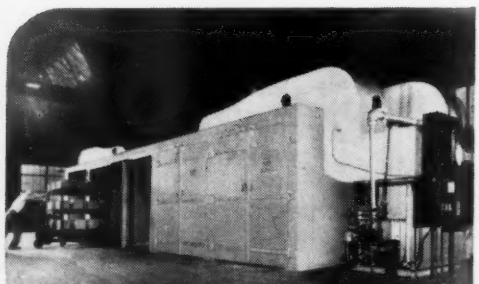
Coleman Tower ® Oven in Automotive Foundry



Coleman Rolling Drawer Ovens
in Brass Fittings Foundry



Coleman Car-Type Oven
in Steel Foundry



Coleman Transrack Ovens
in Pressure Pipe Foundry

A COMPLETE RANGE OF TYPES AND SIZES

for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

Collects More Dust for Fewer Dollars!

Type W ROTO-CLONE design makes it the lowest priced, high efficiency wet dust collector in its class

Why is ROTO-CLONE lower priced? The Type W is strictly a product of AAF research—features a patented design that combines high efficiency with inexpensive construction. Result—the lowest priced wet dust collector in its class (units of 1,500 to 50,000 cfm capacity designed for high efficiency dust collection, including extreme fines).

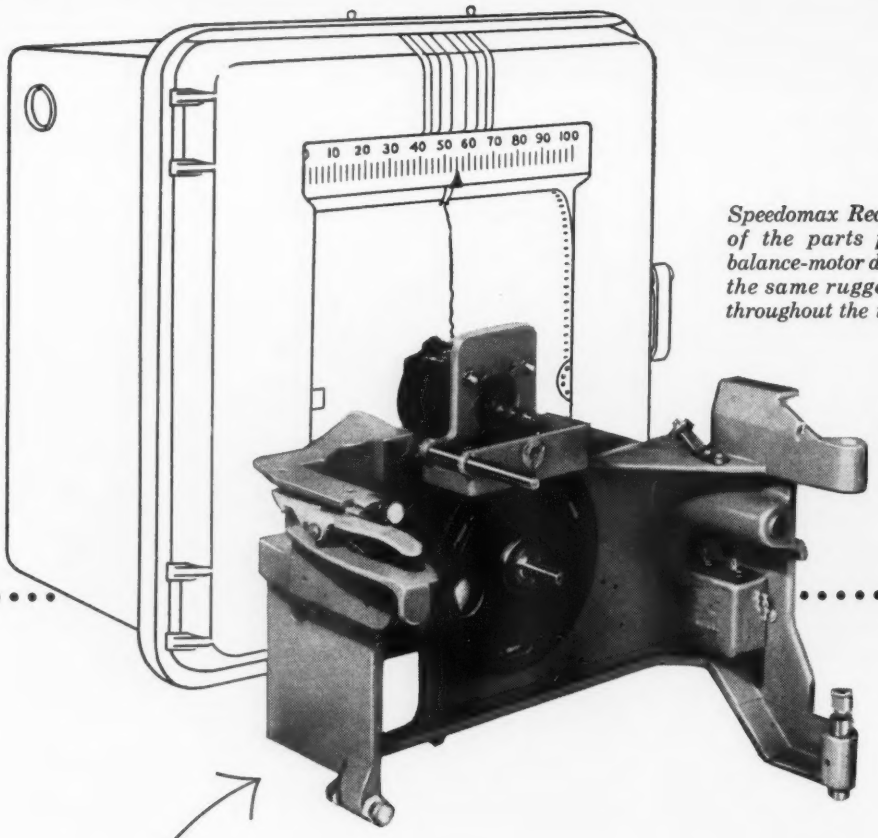
Why are space requirements less? ROTO-CLONE provides everything you need, except duct connections, in one complete, shop-assembled package—high efficiency collector, exhauster, motor and drive. This compactness makes its relocation easy and economical with change in process, plant layout or production equipment.

Why is performance outstanding? Ingenious addition of water sprays extends the effectiveness of this dynamic precipitator to the collection of the finest, lightest dust particles. Unit requires little maintenance; uses a minimum of water and maintains efficiency regardless of variation in air volume.

For complete information, call your local AAF representative or write direct for Bulletin 274.

AAF

American Air Filter
COMPANY, INC.
266 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.



Speedomax Recorder and a few of the parts for its circuit-balance-motor drive. You'll find the same rugged construction throughout the instrument.

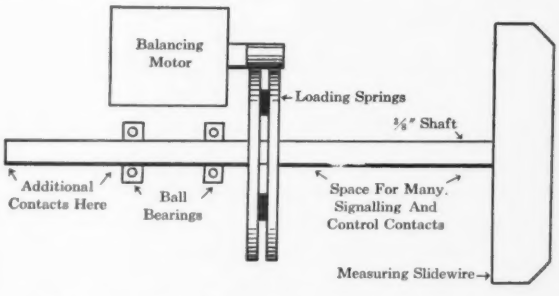
RIGID CONSTRUCTION MEANS Rigid Dependability

● When you turn a measuring or control job over to a Speedomax instrument, much of the good performance you receive is due to the strong, carefully-assembled mechanism controlled by the sensitive electronic circuits. Seasoned, time-proved mechanical design is evident as soon as you open the instrument door.

For instance, just rotate the "big" balancing-gear train with your fingers. You won't detect back-lash. The train will turn at a touch, but those two ⅛" face, spring-loaded gears are held so snugly against the pinions, in opposite directions, that they answer every tiny balancing motion in either direction. The slightest nudge from the "huge" 12-watt balancing motor therefore goes straight to the slidewire, recording and control mechanism via their common shaft. The tying of these functions to one shaft assures permanent alignment of recording, control and measuring functions.

The paper drive and some other components get their positive action in another way. They use machined, heat-treated worm gearing for snug fit and precise motion. Ability to use such designs is one of the many advantages of the instrument's ample power. Liberal use of ball bearings is another quality feature, to transmit full power, reduce routine attention and maintain operating precision.

As you look further into a Speedomax, you'll also note that many parts such as frame castings, shafts, linkages, etc., seem very large. But there's a strong reason for this seeming oversize—it prevents mechanical deflections in operation. Rigid construction gives rigid dependability.

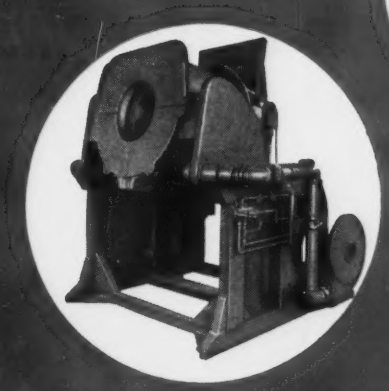


The Speedomax Mechanism "Heart" Is Just 2 Assemblies

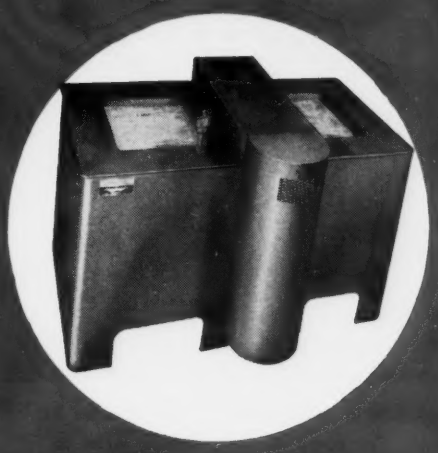
Why not inspect these and other evidences of quality the next time you need an electronic potentiometer or bridge. You can easily check them against the general description in our Catalog ND46(1). If you're interested in research, ask also for Technical Publication ND46(1). Address our nearest office, or 4917 Stenton Ave., Philadelphia 44, Pa.

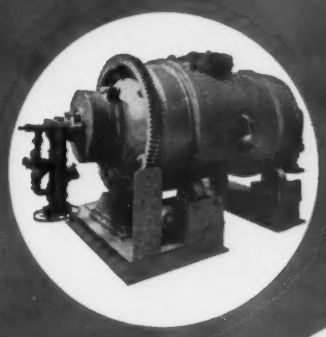
LEEDS NORTHRUP

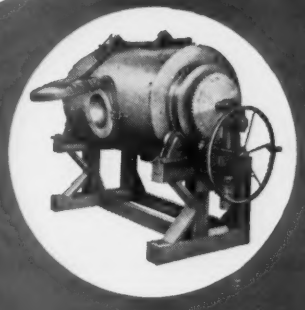
instruments automatic controls • furnaces

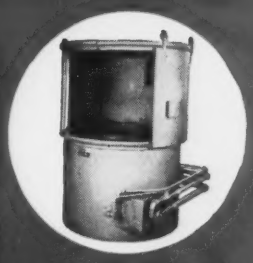


MELTING AND HOLDING FURNACES









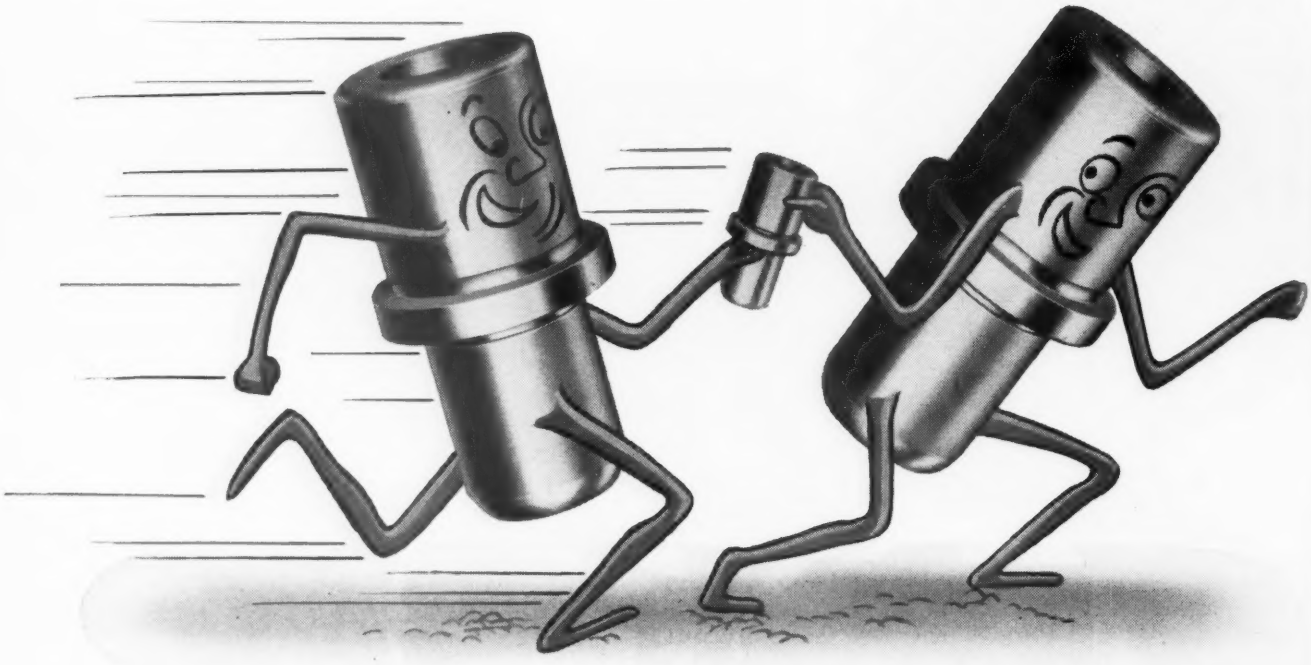
Lindberg-Fisher builds all kinds of melting and holding equipment . . . gas . . . oil . . . electric . . . induction . . . arc and high frequency. Lindberg-Fisher engineers can intelligently and without prejudice recommend the proper type of furnace to best suit your needs and conditions.

Bulletin 551 covers the complete melting line. Write for your copy today.

LINDBERG-Fisher A DIVISION OF LINDBERG ENGINEERING CO.

2453 WEST HUBBARD STREET · CHICAGO 12, ILLINOIS

QUICK CHANGE WITH UNIVERSAL STANDARD PRESS-FIT FLASK PINS AND BUSHINGS



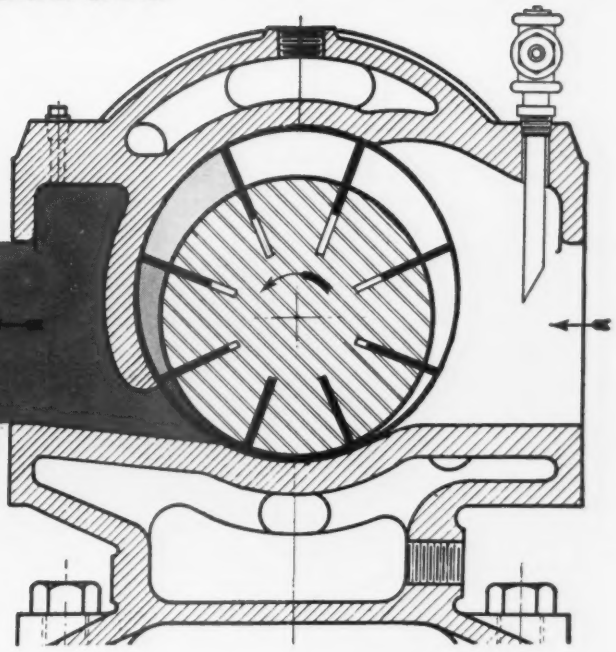
To compensate for wear in the ear holes of cope and drag, standard size Universal Press-Fit Flask Pins and Bushings are available with three different outside diameters, the second slightly larger than the original size and the third slightly larger than the second. Thus, as the ear holes increase in size—and replacement of the original pins and bushings becomes necessary—pins and bushings with a larger outside diameter are available to provide a good, tight fit in the larger ear holes without welding or other expensive, time-consuming operations. Just drive out the old, press in the new . . . truly "quick change"!

Universal Flask Pins and Bushings of all types are available in a complete range of sizes as regular stock items. Plain, taper, threaded or hexagonal series. For complete information, write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

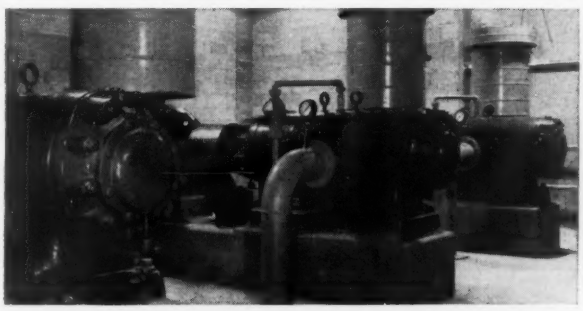
186

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN

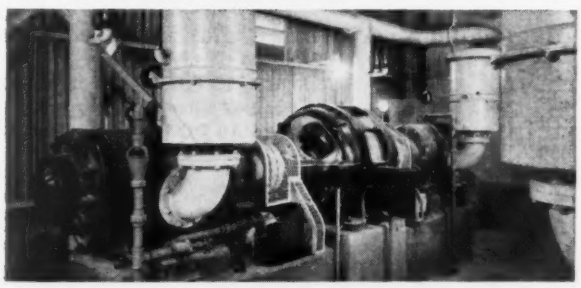
Fuller Rotary Compressors put the SQUEEZE on compression costs



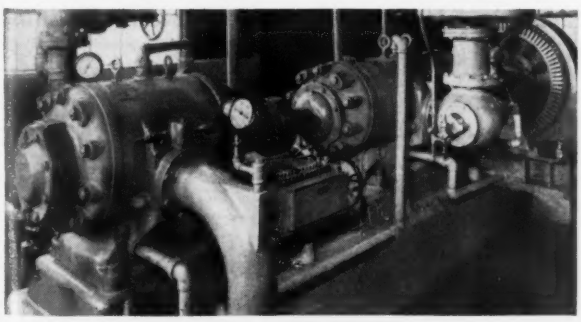
...for pressures up to 125 lb.



Three Fuller Rotary Single-stage Compressors. Capacity each 1400 c.f.m., 19-lb. pressure.



Fuller Rotary Single-stage Duplex Compressor. Capacity 2010 c.f.m., 35-lb. pressure.



Fuller Rotary Two-stage Compressor. Capacity 1665 c.f.m., 100-lb. pressure.

When you consider all the many uses you have for compressed air, you should give careful thought to the best way to get compression with dependability, plus minimum cost and attention —selection of the proper compressor at the required pressures to do the work in the most efficient manner. Fuller builds the compressor that has *earned* a reputation for dependability and long life—for pressures up to 125 psig.

Fuller Rotaries have so many inherent advantages that they warrant your closest examination. Free from reciprocating parts, with no valves to leak or seats to grind, no unbalanced forces to set up vibration, they assure low-cost, smooth-flow operation during their long life. And, they give you *original, maintained capacity*.

Check your compressed-air needs . . . a Fuller engineer, specializing in compressed-air engineering, will give you the *right* recommendation to enable you to produce air efficiently, and at the lowest possible cost. Write now.

FULLER COMPANY, Catasauqua, Pa.

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Fuller

C-237
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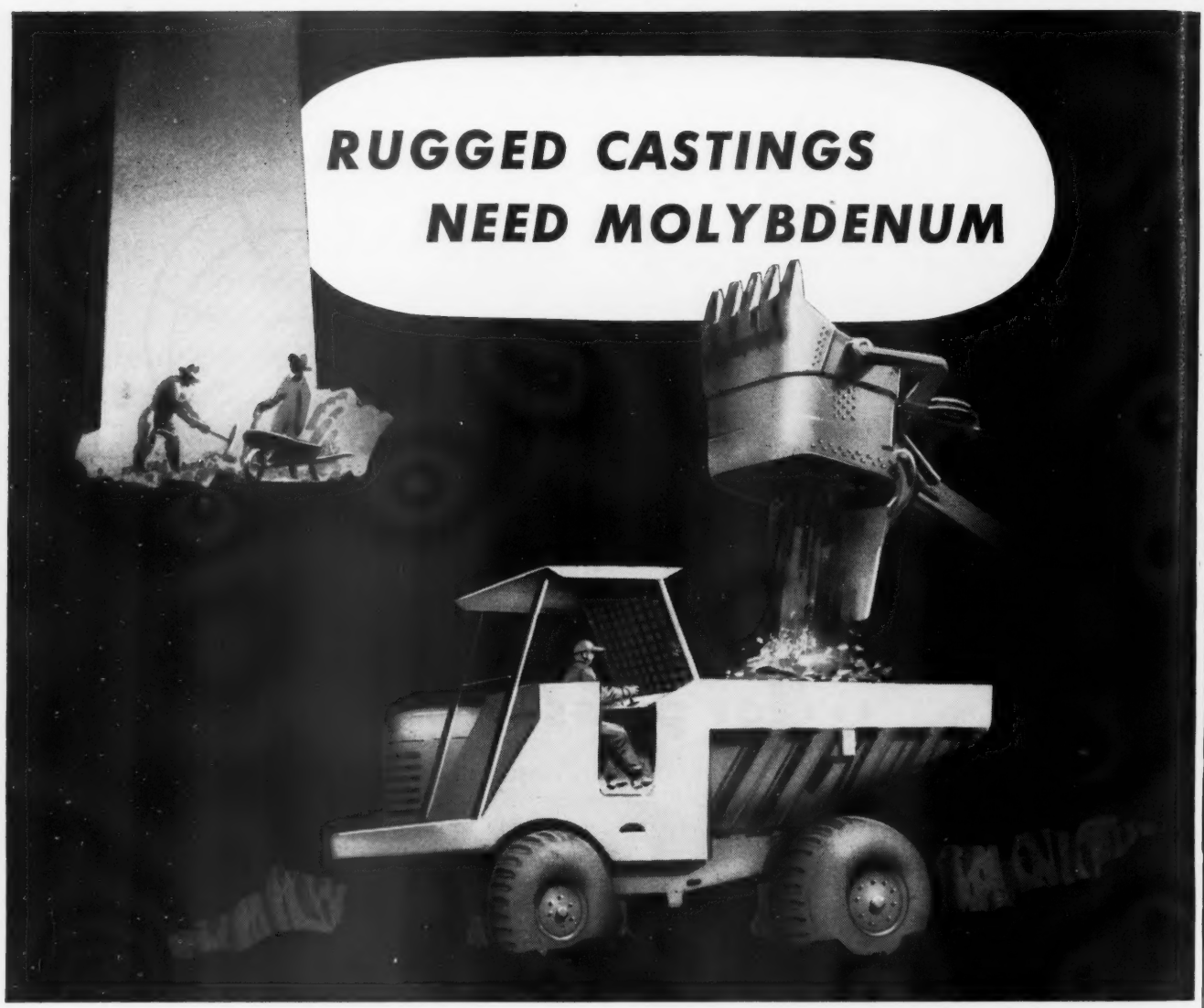
Pioneers of high-efficiency vane-type rotary compressors



Accepted by foundrymen all over the world as an alloy they can use when they really need reliable help, Molybdenum answers all demands.

Alloys of Molybdenum, dissolving rapidly at normal steel or iron melting temperatures are available and their use is widespread.

Your customers feel comfortable when they know MCA "moly" is in their castings. Casting salesmen are satisfied their customers will have full confidence in Molybdenum iron or steel. Foundrymen's full knowledge of how to handle Molybdenum makes for a maximum performance. All of this adds up to Molybdenum in your iron and steel castings as positive assurance of expected performance.

As recognized authorities in the application of Molybdenum, Tungsten, Boron, Rare Earths, and the alloys and chemical elements of these materials, MCA assures confidential and immediate response to inquiries.

MOLYBDENUM

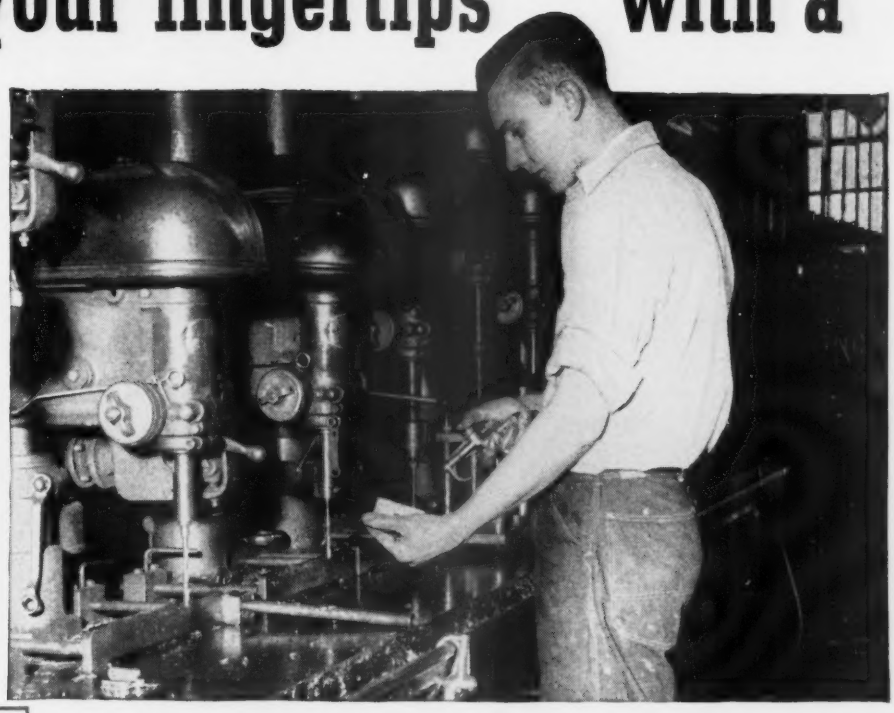
CORPORATION OF AMERICA

Grant Building **Pittsburgh 19, Pa.**

Offices: Pittsburgh, Chicago, Detroit, Los Angeles, New York, San Francisco
Sales Representatives: Edgar L. Fink, Detroit; Brumley-Donaldson Co., Los Angeles, San Francisco
Subsidiary: Cleveland Tungsten, Inc., Cleveland *Plants:* Washington, Pa., York, Pa.

MCA

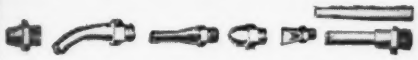
Put air at your fingertips with a Schrader Blow Gun



No. 9326 Drop Forged Stainless Steel | No. 7184 All Purpose Brass Button Type | No. 8785 Forged Brass Lever Type

ADJUSTABLE NOSES

NON-ADJUSTABLE NOSES



Choose the Blow Gun that suits you best from the thirty-six designs and styles of Schrader Blow Guns available. The interchangeable adjustable and non-adjustable noses also available make Schrader Blow Guns the most versatile you can buy.

You'll find there are Schrader Blow Guns that *just suit* any operation you may have . . . blow guns that put air *where* you want it . . . *when* you want it . . . reliably and economically. The #9326 Schrader Blow Gun shown in use above, for instance, will take years of the toughest treatment you can give it. Here's why . . .

- **It's rugged,** both in design and construction. This Schrader Blow Gun is *drop forged* of stainless steel to give you years of trouble-free service. Combine this with its countersunk nose and shielded operating button—and you'll see why it went right back on the job, even after we dropped it out of a tenth-floor window . . . then ran over it with a six-ton truck.
- **It's convenient**—Notice the handy hang-up hook. Hang the gun close to where you need it . . . and remember, too, this hook acts as a safety guard, to help keep hands away from moving machine parts.
- **It's economical**—This Schrader Blow Gun—or *any* Schrader Blow Gun—shuts off tightly the instant you lift your finger. A Schrader Blow Gun delivers air only while it's needed.

And this is only one of many designs and styles of Schrader Blow Guns available to you. At the left, you'll see typical examples of the several blow guns with interchangeable noses that will give you *exactly the blow gun you need.* Get full information by return mail!

Just write—or fill out the coupon below.

Schrader
REG. U. S. PAT. OFF.

products

control the air

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

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Division of Scovill Manufacturing Company Incorporated
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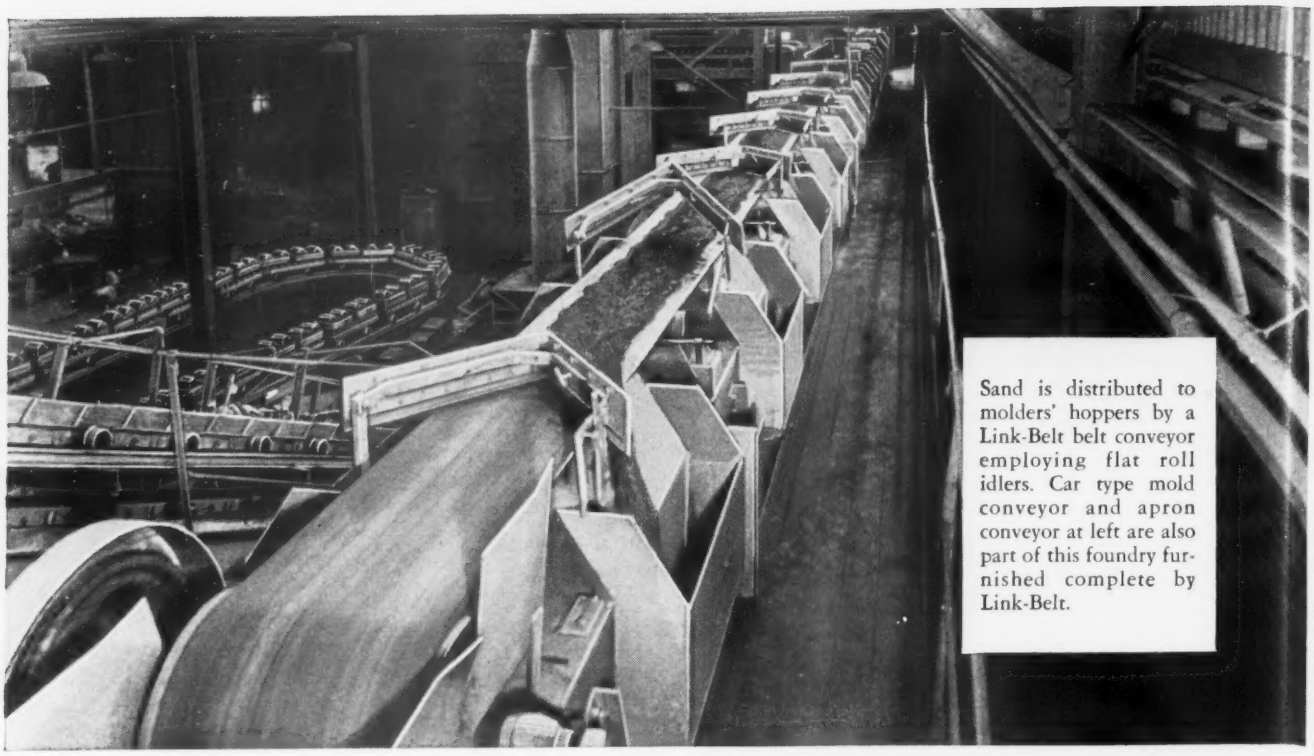


Sand is distributed to molders' hoppers by a Link-Belt belt conveyor employing flat roll idlers. Car type mold conveyor and apron conveyor at left are also part of this foundry furnished complete by Link-Belt.

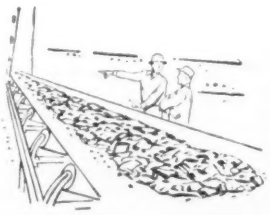
SURE ROAD TO LOWER HANDLING COSTS

... carry the load via Link-Belt belt conveyors

LINK-BELT offers you the "total engineering" so necessary for top efficiency

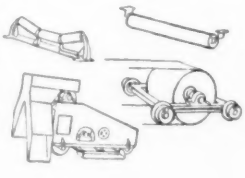
DESIGNED FOR OVERALL EFFICIENCY—Because of its unrivaled experience, Link-Belt can do a better job of gathering and analyzing all data. Proposals reflect this understanding of the most practical way to fit individual conveyors into your overall system requirements for best results.

DELIVERS FULL RATED CAPACITY—Link-Belt follows through on every detail of the job, including electrical controls and even wiring and foundations. What's more, Link-Belt will furnish experienced erection superintendents, staffs and skilled crews at the customer's request.



ASSURES SATISFACTORY PERFORMANCE—When you rely on Link-Belt as a single source for your complete system, we accept responsibility for placing it in full operating readiness. We will also supervise modernization of existing systems. For all the facts call your nearby Link-Belt sales representative.

BUILT FOR LONG-LIFE PERFORMANCE—Link-Belt manufactures all components and related feeders and conveyors. You are assured of the right equipment because of this breadth of line. And Link-Belt will supply the highest grade belts engineered to the specific job.



LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

NEW ROTOR AIR GRINDERS

. . . FOR CONE WHEELS AND 4" STRAIGHT WHEELS

NEW DESIGN . . . . . more powerful
. . . . . long service life

8500 RPM . . . . . fast grinding

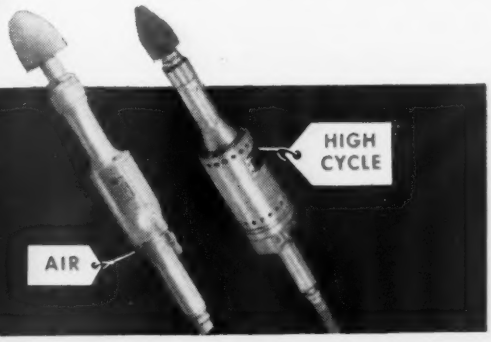
ONLY 8½ LBS. . . . . . less fatigue
. . . . . more output

SPECIFICATIONS

WEIGHT . . . . . 8 lbs., 8 oz.
LENGTH . . . . . 20½"
(19" for spade handle model)
SPEEDS . . . . . 8500 RPM
6000 RPM
EQUIPMENT (Standard)
⅜" x 11 Spindle, Wheel Guard
EQUIPMENT (Optional)
½" x 13 Spindle, Cone Wheel Adaptor

The big difference is in the new motor. Some grinder!

ASK FOR BULLETIN NO. 43.



THE ROTOR TOOL CO.
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Chicago
RESINOID
Grinding
Wheels

Remove
METAL Faster

When high-speed stock removal is required, even to the closest tolerances, use Chicago Resinoid Grinding Wheels. They have greater strength, longer life, and have been proven for efficiency. Available in the size and grain necessary for the job.

Complete Line of Abrasive Products

Let Chicago Wheel's carefully engineered abrasive products work for you. They're recommended by machinists everywhere, and backed by more than 50 years of manufacturing experience.

Mounted Wheels • Grinding Wheels
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Novaculite • "XL" Bond Wheels

Dept. F
CHICAGO WHEEL
& Mfg. Co., Quality since 1895
1101 W. Monroe Street
Chicago 7, Illinois

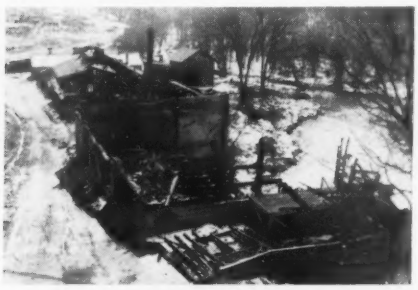
Readers' Comment

Wood Framing Is Fire Hazard

TO THE EDITORS:

Our plant was almost totally destroyed by fire on the night of Feb. 16.

We are enclosing several photographs showing the damage. It is hard to estimate the extent of the damage in dollars, but it is safe to say that it will exceed $150,000, although the figure would be very much higher if we were to attempt to replace all of the buildings which were destroyed.



Actually we had a complete woodworking shop and paint and assembly area, although convenient for making flasks and bottom boards, not essential to our present type of business. Contractor's estimates to date indicate we may get our foundry operating again in from four to six weeks. Reestablishing our machine shop will take somewhat longer.

You can tell your readers that on the basis of our experience, wood frame buildings, even with slate and metal roofs, are a poor investment when in the vicinity of a cupola.

WILBUR C. RICE
President

Greenwich Mfg. Inc.
Greenwich, N. Y.

* * *

High-Energy X-Rays

TO THE EDITORS:

In the article "Radiographic Characteristics of High-Energy X-Rays" in the February issue of FOUNDRY, Mr. Pace has presented some very interesting data in the field of betatron radiography which should be of real value to industry concerned with the inspection of heavy castings.

However, I feel that it would be a serious injustice to let the manuscript become a part of the history of radiographic progress without pointing out what we believe to be a number of important errors.

1. Error in transmission curve. In Fig. 2 the HVL for steel is shown to be about 15 in., which is ten times too great. If the abscissa and ordinate are interchanged, the results are more logical. (Editor's Note: The error is ours. In preparing the chart for the engraver, the designations for the abscissa and ordinate were inadvertently transposed.)

2. Optimum x-ray energy miscalculated. If data from the radiographic exposure chart, Fig. 3, is plotted to determine the thickness of steel penetrated in one minute, it is obvious that a sharp peak results at 10 MEV rather than as shown on Fig. 4. However, it is more important to note the erroneous way in which the author concludes that the most penetrating energy for steel lies between 10 and 15 MEV. The true measure of efficiency in penetrating materials can only be based on absorption coefficients at various energies (or equivalent criteria such as half value layer or slopes of exposure curve).

There are several exposure variables which can be adjusted to shift the position of the peak of the curve showing energy for maximum penetration in one minute. Any change in lead foil screen thickness at different energies will produce different film density, requiring a change in exposure time, and therefore will increase or decrease the amount of steel penetrated in one minute. This can easily shift the peak of the author's curve (Fig. 4), in either direction.

Secondly, if the author had measured the roentgen calibrated in a lucite jacket as used by the National Bureau of Standards and most laboratories rather than with an (intensifying) lead-jacketed calibrating chamber, he would have found the rate of exposures used were too low at the higher energies. This is because the ratio of intensification between lead and lucite jackets increases from 1.5 at 10 MEV to 2.7 at 50 MEV. However, even if the exposure rate is corrected, the curve will show that more steel is penetrated at 50 MEV in one minute than at any lower energy. This indicates that perhaps there is no maximum penetrating energy.

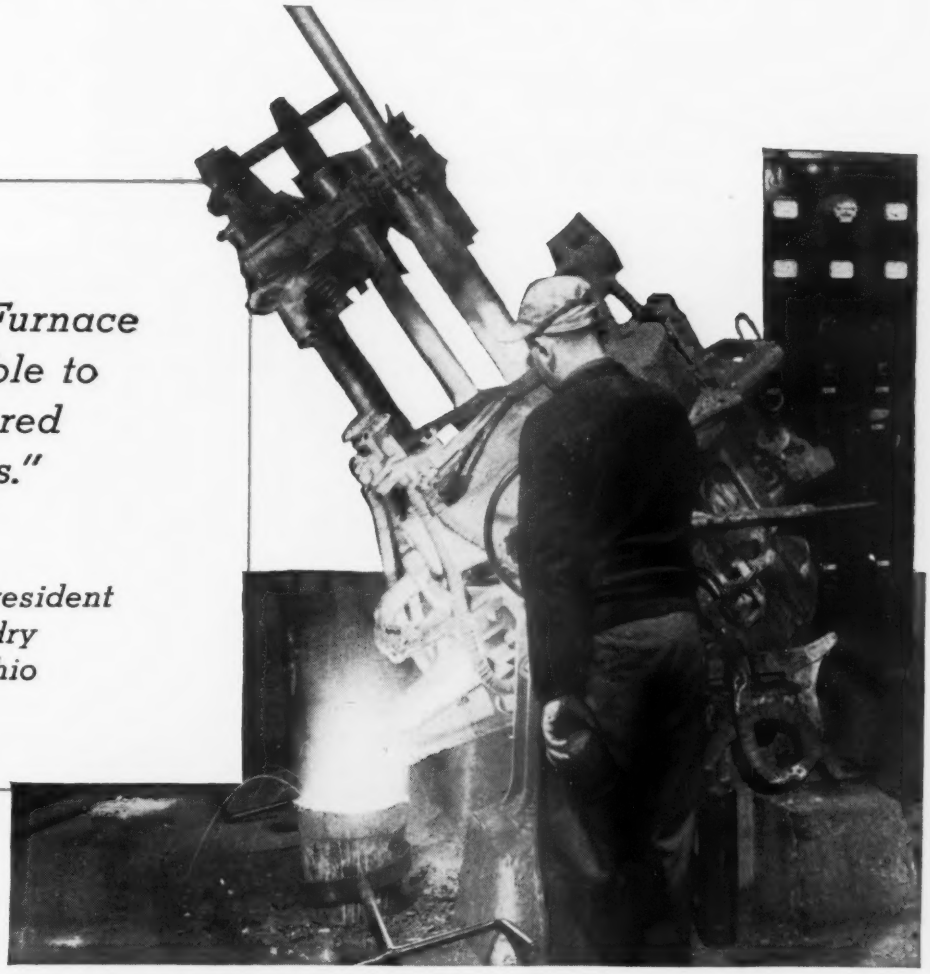
However, Westendorp and Charlton, of the General Electric Laboratories, by comparing absorption coefficients from 4 to 100 MEV found a definite maximum of transmission of energy through steel at about 25 MEV, with little change taking place

(*Continued on page* 94)

This *Lectromelt** controls quality of special gray iron castings...

"Our Lectromelt Furnace makes it profitable to go after engineered castings business."

Frank Dost, President
Sterling Foundry
Wellington, Ohio



Sterling Foundry's 250-lb. Lectromelt Furnace in action. Averaging 400 lbs. per melt, this sturdy furnace is used for producing alloy iron to meet specifications for engineered castings.

When specifications require special alloy iron castings, Sterling Foundry depends on their Lectromelt. It gives the exact control of heat and analysis needed to make today's engineered castings. With metallurgical research finding more and more uses for special alloy castings, specifications are tougher. Yet a good foundry with a Lectromelt Furnace can meet these rigid specifications.

If you can see the extra business potential possible with an electric, write for Lectromelt Furnace information. Our engineers will answer your questions and supply you with catalog information covering all sizes of Lectromelts, from 25 lbs. to big 150-ton steel furnaces. Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Brossoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

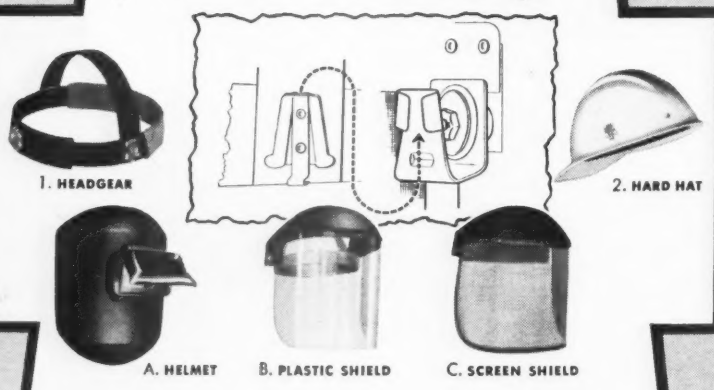
*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*

CESCO RIGHT... before your Eyes!

NEW Mounting



Assemble Your Own Combinations

Here's a way for you to save money on head, face, and eye protection equipment. Now you don't have to buy duplicate headgears or hats. If you need a helmet (A) and face shield (B), buy them along with only one headgear (1) or hard hat (2).

Items **A, B** and **C** can be used with either items **1** or **2** illustrated above so you can make six different combinations. The old-fashioned way you would buy a helmet and headgear, a shield and headgear, and so on until you had six combinations (twelve items) to do the same thing these five separate pieces will do.

The new CESCO Mounting has an easily adjusted tension spring to compensate for weight differences. Tilting mechanism permits easy raising and lowering. Wedge shaped brackets slide apart or together quickly, and lock securely.

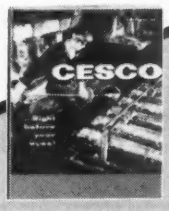
Save buying extra parts . . . save money

On your next order specify CESCO interchangeable helmets and face shields.

They're—"*Right...before your Eyes.*"

Send TODAY

for CESCO literature and the name of your CESCO safety equipment distributor



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CESCO FOR SAFETY

OFFICES IN: Atlanta, Birmingham, Boston, Buffalo, Cincinnati, Cleveland, Columbus, Dallas, Detroit, East Orange, Houston, Indianapolis, Kansas City, Knoxville, Little Rock, Los Angeles, Louisville, Mexico City D.F., Milwaukee, Montreal, Peoria, Philadelphia, Pittsburgh, Salt Lake City, San Francisco, Spokane, St. Louis, St. Paul, Toledo, Tulsa, Wichita

(*Continued from page* 92)

over the 20 to 30 MEV range.

The author's statement that the trend of exposure time is decreasingly less up to 10 MEV and then reverses, does not correspond with the results of work in our laboratory. We have found the exposure time to be decreasing up to at least 20 MEV. Dietze and Call, also of General Electric, show a flatter exposure curve at 15 MEV than does Pace. Data from Wideroe, of Brown Boveri, indicates a definite reversal in the slope of exposure curve at about 30 MEV.

3. 15 MEV does not produce maximum field size. The author continues that by raising the frequency, rather than the energy, high output is produced "at the most penetrating voltage with the maximum x-ray field size." This seems to ignore the well established practice of x-ray beam flattening by the use of a compensator to produce any field size desirable at any energy.

4. Overoptimistic claims for sensitivity. The claims for radiographic sensitivity shown at either 15 MEV or 50 MEV in Fig. 9 cannot possibly meet the standards set by military specifications MIL-R-1147; (ORD). Studies by the Los Alamos Scientific Laboratory, Brown Boveri, and our own Laboratory show that for positive identification of penetrameters the sensitivities are not anywhere as good as those indicated by Pace, and do not remain constant for thicker sections.

5. Variable voltage not practical. Our early thinking was that betatrons with a variable voltage feature would be very useful to control field size and contrast. Ten years of experience with betatrons in industrial use have taught us that practically no one ever uses the feature. The reason is well brought out in the paper by Dietze and Call, who showed that the x-ray intensity drops off approximately as the 3rd power of the voltage. (At 5 MEV, twenty times as long an exposure is required as at 15 MEV.) Furthermore, radiographic contrast changes very slightly from 10 to 30 MEV.

In spite of these comments, I think Mr. Pace's article graphically shows the many advantages obtainable in the field of megavoltage radiography.

D. T. SCAG
Engineer-in-Charge
Betatron Group

Allis-Chalmers Mfg. Co.
Milwaukee 1

References Cited

1. McElhinney and Siewers, "Responses of Various Detectors to Bremsstrahlung up to 50 MEV," Report 1000.
2. Miller and Steely, "Some Experimental Findings and Operating Practices in Betatron Radiography," *Nondestructive Testing*, November, 1953, 35-40.
3. Storm, "The Response of Film to X

(*Continued on page* 96)

Economize with Q-ROK*

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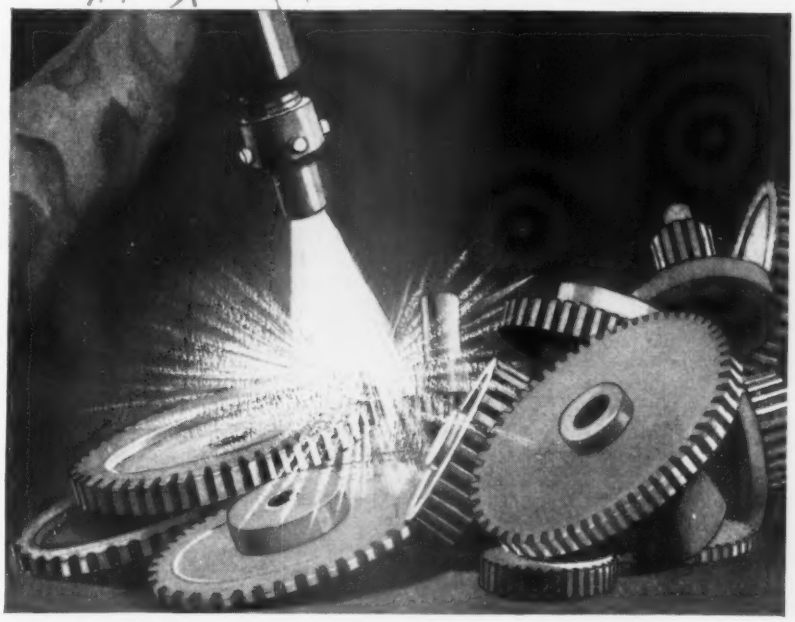
*CRUSHED QUARTZITE ABRASIVE
FOR QUALITY BLAST CLEANING



Offers you 5 Advantages

1. REDUCES CLEANING COSTS
2. SAVES TIME, CLEANS FASTER
3. DOES NOT EMBED IN METAL
4. WEARS NOZZLES LESS
5. AVAILABLE IN FIVE SIZES

Much less expensive, Q-ROK offers lowest material and labor costs per square foot of cleaning. Because of its ideal hardness factor and unique cutting ability, Q-ROK cleans faster, yet does not embed in the metal. In addition, Q-ROK definitely causes less wear on nozzles. Available in five different sizes, there is a grade of Q-ROK for every cleaning need, to satisfy every surface finish desired. Write today for free samples and prove to yourself that Q-ROK blast cleans better, faster and more economically than any other abrasive!

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THE SURE START TO A PERFECT FINISH

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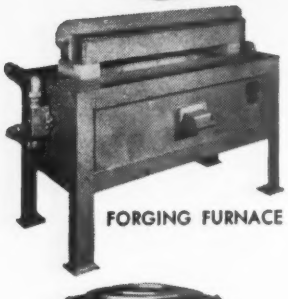
Nation-wide Service from Seven Plants

MOLDING SAND • CORE SAND • SILICA FLOUR • SANDBLAST SAND • SHELL-MOLDING SAND

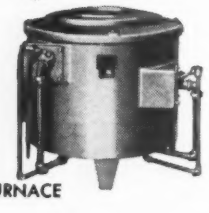
get the best out of your tool steel through

PROPER DRESSING

FORGING HAMMER



FORGING FURNACE



POT FURNACE

QUENCH TANK

TEMPERING FURNACE

TOOL GRINDER

Here is a "Package" that will get rid of a costly and annoying problem . . . In fact, it will save up to 60% of costs for cutting and chipping tools . . . the best life is gotten out of today's steels through proper dressing . . . proper steel; properly treated, will reduce costs substantially. Now, at your own convenience, you can dress as many tools as are needed, and keep close control of your tool inventory.

The complete "Tool Dressing Package", entirely engineered by LOBDELL UNITED CO., (subsidiary of United Engineering and Foundry Co.) . . . includes all of the Forging, Heat Treating and Dressing Equipment . . . plus, the practical methods needed . . . and this "Package" not only reduces inventory costs, but it can do this at *low initial cost*, recoverable nominally in one year . . . without special metallurgical control.

The "versatile" NAZEL Electro-Pneumatic Forging Hammer is the LOBDELL UNITED CO. product . . . For the additional equipment presented within this "Package", LOBDELL is joined by a group of the most reputable leaders in their fields:

Heating Equipment by Eclipse Fuel Engineering Company

Tool Grinding Equipment by Black and Decker Company

Accessory Tools and Tool Steels by Bedford Tool and Forge Company

A copy of LOBDELL's new "Tool Dressing Package" Bulletin will give you further details.

LOBDELL UNITED COMPANY

1836-1954 WILMINGTON 99, DELAWARE

A SUBSIDIARY OF UNITED ENGINEERING AND FOUNDRY COMPANY

(*Continued from page* 94)

Radiation of Energy up to 10 MEV," report LA-1220.

4. Allis - Chalmers, "Betatron Instruction Manual," Section VIII.

5. Westendorp and Charlton, "A 100 million Volt Induction Electron Accelerator," *Journal of Applied Physics*, Vol. 16, No. 10, 581-593.

6. Wideroe, "31 MEV Radiographic Inspection of Metal Parts," *Brown Boveri Review*, page 301, September, 1951.

7. Tenney and Miller, "Various Penetrameter Types and Their Limitations," Los Alamos Report, group GMX-1, October, 1952.

8. Dietze and Call, "The General Electric Industrial Betatron" *Nondestructive Testing*, May, 1953, 9-14.

* * *

Gray Iron Ads Pull Inquiries

TO THE EDITORS:

I would certainly like to express our appreciation for the nice spread you gave us on our current national series of advertisements in the February issue of FOUNDRY. As I have told you, our inquiries are in excess of 2000 a year and the curve has been rising steadily now that we have had six continuous years of advertising.

DONALD H. WORKMAN
Executive Vice President
Gray Iron Founders' Society Inc.
Cleveland 14

* * *

Comments on a Question

TO THE EDITORS:

I realize that in the "Question and Answer" section of FOUNDRY insufficient facts are given many times. Hence it is almost impossible to give a correct answer or solution. However, I would like to comment on two of the answers in the February issue.

The first on page 116 is entitled "Core Sand for Small Bushings" and describes the defect as "When the cores are knocked out of the castings we find a lot of fins where the metal apparently has eaten into the core." In the answer the statement is made: "A possibility exists that what you describe as fins in the cavity, in reality are spalls lifted or forced from the core surface by gas denied exit through suitable vents, or by sand lacking in permeability."

The description of the defect as noted seems to fit that of a vein or in severe cases where many of the fins are found on the surface as a defect referred to in foundry lingo as the "map of Ireland." If my analysis of the defect is correct, then the plastic flow of the core sand mixture must be increased to eliminate the trouble. This usually is accomplished by addition of additives or by changing from a pure silica sand to sand such as Michigan lake sand. Common additives used for increasing plastic flow are iron oxide or a clay substance such as found in naturally bonded sand or the bentonites or foundry clays.

(*Concluded on page* 98)

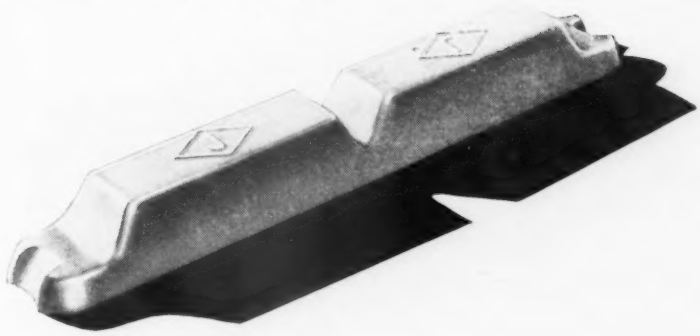
HIGH STRENGTH IS ONLY ONE PROPERTY*

ALMAG 35

ALUMINUM ALLOY

Also Offers

- ELONGATION — 14%
- CHARPY IMPACT — 10.47 psi.
- YIELD STRENGTH — 20,000 psi.
- TENSILE STRENGTH — 40,000 psi. Typical



As-Cast, with no heat treatment or age hardening, Almag 35 is the only light metal alloy which possesses this combination of properties for sand-cast, permanent mold, or die-cast applications. All properties are developed immediately upon casting.

IN NO OTHER ALUMINUM ALLOY Do You Get ALL of These Properties

SPECIFY ALMAG 35 — Ask for Bulletin 350.

COVERED by U.S. PATENTS Nos. 2564044, 2628899 and 2583473

WILLIAM F. JOBBINS INCORPORATED

AURORA, ILLINOIS

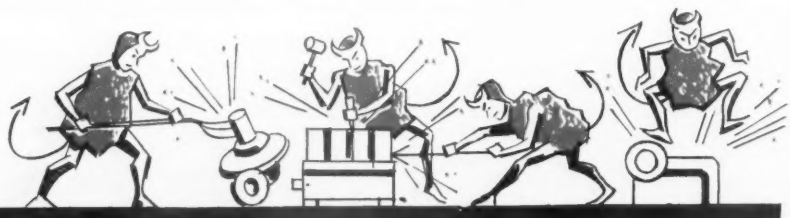
P. O. BOX 230

* HIGH CORROSION RESISTANCE
SUPERIOR MACHINABILITY — MIRROR FINISH
DIMENSIONAL STABILITY AS-CAST
NO HEAT TREATMENT — NO AGE HARDENING

Have You Thought ?

Sand can be the most expensive material used in your foundry.

The Hardy Sand Company uses every practical scientific means possible to supply you with the cheapest sand you can use in your foundry, and yet be assured of the control of product characteristics and constant uniformity.



Sand Uncontrolled Can Create Havoc

We have available Foundry Consultants to help you, *at no charge*, with any of your molding or core problems. Free samples of Hardy Sands, to your specifications, are available upon request.

The Hardy Sand Company produces Natural Bonded Sand, Washed Silica Sand, and Bank Sands, and are distributors for Mold-Rite, Big-Horn Bentonite, and Refract-O-Mold Spray.

REPRESENTATIVES

Wisconsin, Minnesota, Western Michigan
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Producing controlled foundry sands for almost fifty years.

HARDY SAND COMPANY

POST OFFICE BOX 476 EVANSVILLE 3, INDIANA

(*Concluded from page* 96)

In all probability the second mixture suggested: 14 parts washed and dried silica sand, 4 parts molding sand, 1 part of cereal, plus approximately 1 per cent by weight of core oil, will do the job. The reason this mixture will eliminate the defect is because it contains molding sand which is made up of silica sand and *clay substance*.

The second on page 118 is entitled "Strainer Gates Filter Metal." It is a misconception that strainer cores strain slag from the metal. I will grant strainer cores will strain out particles of slag larger than the holes in the core. However, they will not strain out fine slag or slag which has a melting point slightly above the melting point of the metal. The primary function of the strainer core is to act as a choke, thereby decreasing the velocity of the metal and permitting the slag which is lighter than the metal, to rise to the surface and be trapped in the gating system.

This also can be accomplished, if space permits, by placing a choke in the runner bar between sprue and the ingates. Likewise, if the velocity of the metal is decreased in any other way and a sufficient time interval is allowed, the slag will rise to the surface and be trapped. If the velocity is not decreased in the gating system, the slag will be carried by the metal into the casting cavity where there always is a decrease in velocity because that area is greater than the combined areas of the ingates. The slag will be found in the casting at a location where the greatest decrease in velocity of the molten metal takes place.

ELMER C. ZIRZOW
Director of Foundry Service

Werner G. Smith Inc.
Cleveland 13

* * *

Likes Appraisal of Turkey

TO THE EDITORS:

Any Turk reading the article by Harold E. Henderson in the February issue of FOUNDRY should be indebted to him for an honest and understanding presentation to the American public of economic and technological conditions in that wonderful country.

The average American does not fully realize what gallant and true friends we have there in the Middle East. The Turks deserve all our help, and there is no other country in the world where our American tax dollar has been better invested than in Turkey. My congratulations to Mr. Henderson for a fine job done.

MAX T. GANZAUGE
Foundry Superintendent

General Railway Signal Co.
Rochester 2, *N. Y.*

BE SAFE WITH SiPi QUALITY
BE SAFE WITH SiPi SERVICE
SiPi METALS CORP.
PRIME PRODUCER OF NON-FERROUS ALLOYS
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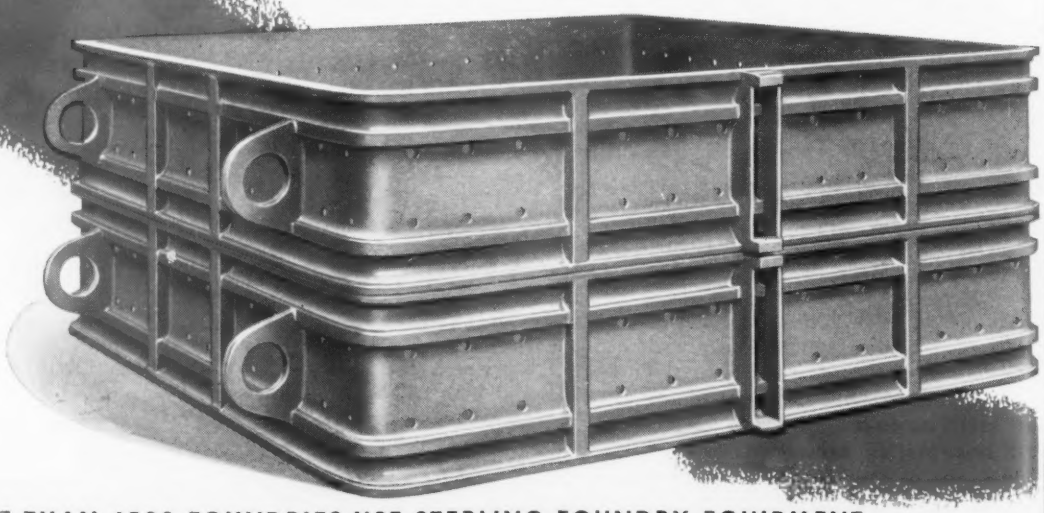
Ruggedly Constructed to Fit Your Needs ... Limited Only by Shipping Restrictions

You can get any foundry flask you need from Sterling . . . no matter how "special" your requirements may be . . . flasks for hand or machine molding . . . for green sand or dry sand . . . for jobbing or production work. Sizes range from the small bench type flask to the very largest size accepted by the transportation companies. Sterling Steel Flasks are built to rigid specifications according to modern engineering design. If you have ANY flask problem . . . Consult Sterling. Ask for Sterling Catalog No. 64A.

STERLING WHEELBARROW CO., Milwaukee 14, Wis., U.S.A.

Sterling Style "E"
Flask for small and medium sized work. Available with interchangeable copes and drags, combination pin lugs and handles.

Style 3/8 ND-RT
Special (72" x 72" x 15"C x 15"D). This is a heavy duty rolled steel flask with special heavy reinforcing bars on both cope and drag. Lifting loops for convenient handling.



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MORE THAN 4500 FOUNDRIES USE STERLING FOUNDRY EQUIPMENT

Weed Out the Waste

The pent-up demand for castings, which followed World War II and was accelerated during the Korean War, resulted in the infiltration of wasteful practices among many companies. With pressure for delivery of castings constantly present, and with backlogs growing, it is not at all strange that economies of both men and materials frequently were neglected. Management was so intent on meeting production schedules that factors of cost became of secondary importance. Furthermore, an unrealistic corporate tax structure only accentuated the disregard of added items of cost.

Now the picture has changed. Demand is down, backlogs have all but disappeared, operating schedules have been reduced, and the frequently ignored break-even point certainly has taken on greater significance. Competition for castings orders has become intense. To meet this competition, and in many cases to show a profit on a lower volume of business, production economies must be developed and put into practice. It is time to weed out these wasteful practices and thereby reduce costs of production.

How should management go about solving this problem? The first step probably should consist of an audit or study to determine the degree of efficiency with which manpower and facilities are used. Such a study made within the organization or with the aid of experts trained in determining efficiency of operations, frequently will produce surprising as well as highly gratifying results.

For example, a gray iron foundry producing approximately 17 tons of castings a day, recently had such a study completed. As a result of the information developed, and with no capital expenditure, the company has succeeded during the past 60 days in operating with 16 less employees, and at the same time has increased the output slightly, due to a decrease of 6 per cent in scrap loss. This represents a yearly saving of over $60,000 in manpower alone. The study also shows that plant personnel may be reduced by an additional 23 employees through a reasonable capital expenditure. Other foundries probably have produced similar results.

With such savings in production costs apparently possible among some foundries, isn't it time for you to take a good look at your operations to see if you are buying men and materials that you do not need?

Frank G. Steinebach
Editor

GATING

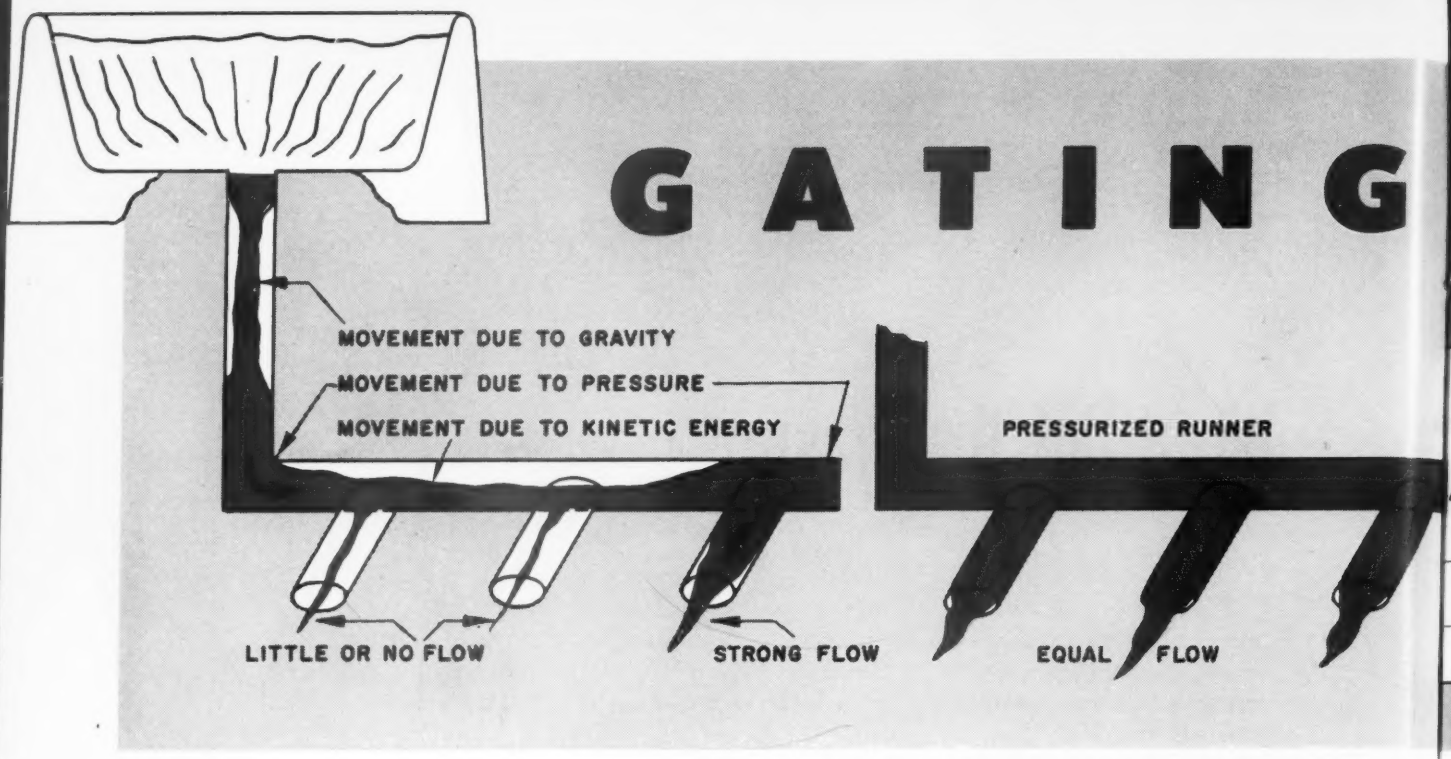

Fig. 1—Illustrating the basic concepts of gating

Summarizing results of gating system studies conducted at the Naval Research Laboratory, this report aims to develop simple working concepts which the foundryman can apply to the practical design of gates

DURING recent years it has been demonstrated that the flow of liquid metals in gating systems is in conformance to hydraulic laws. As a consequence, many gating practices which were based on the assumption that to introduce metal into the mold at desired locations simply involved placing ingates at these locations were shown to be wrong.

It is the purpose of this report to summarize the results of studies of gating systems conducted at the Naval Research Laboratory [1-9] with the aim of developing simple working concepts applicable to practical gating design. There is no attempt to present specific gating systems for specific castings or to present complex hydraulic formulae but rather to develop a broad basic understanding of the means by which the desired control over the flow of metal through gating systems may be achieved.

To this end it is essential to understand how certain basic physical laws of hydraulics affect volume rates and velocity of flow in the various portions of a gating system. Provided with this information the foundryman should "think through" to a solution of specific gating problems as these arise in practice.

The subject of hydraulic theory may appear complicated if presented in terms of formulae which are used for the design of hydraulic systems. However, as applied to gating systems it is necessary only to recognize the significance of simple first principles. Fig. 1 illustrates these principles, which may be summarized as follows:

1. The transfer of liquid through an opening or from one channel to another (sprue cup to sprue, sprue to runner, runner to ingate) requires energy.

2. The energy required to cause or continue the movement of a liquid mass may be derived from position (gravity fall), pressure (hydraulic head), or motion (kinetic energy).

3. When flow occurs due to pressure an increase in kinetic energy usually results, i.e., part or all of the pressure energy is translated to energy of motion. Whether the transfer of energy is partial or complete depends on the pressure drop consequent to the flow.

4. Liquid in motion tends to follow a straight line path and to ignore lateral openings.

5. Whenever a straight-line path of flow is interrupted by an obstruction (turn, etc.), a pressure zone tends to develop due to "piling up" of the liquid, i.e., kinetic energy is translated to pressure energy.

6. Pressurization is the most effective way to ensure movement of liquid to all available channels of hydraulic systems.

The potential energy of the metal in a gating system is highest at the pouring cup. The design of the pouring cup and the rate of filling determine the level of energy which is available to cause flow from the cup to the sprue. Increasing the level of liquid in the cup adds pressure energy to that of gravity which exists because of the high position of the cup.

If the rate of delivery of metal from the sprue cup to the sprue is such that the sprue does not develop an appreciable height of metal, flow into the runner will occur almost entirely by the kinetic energy devel-

FACTORS

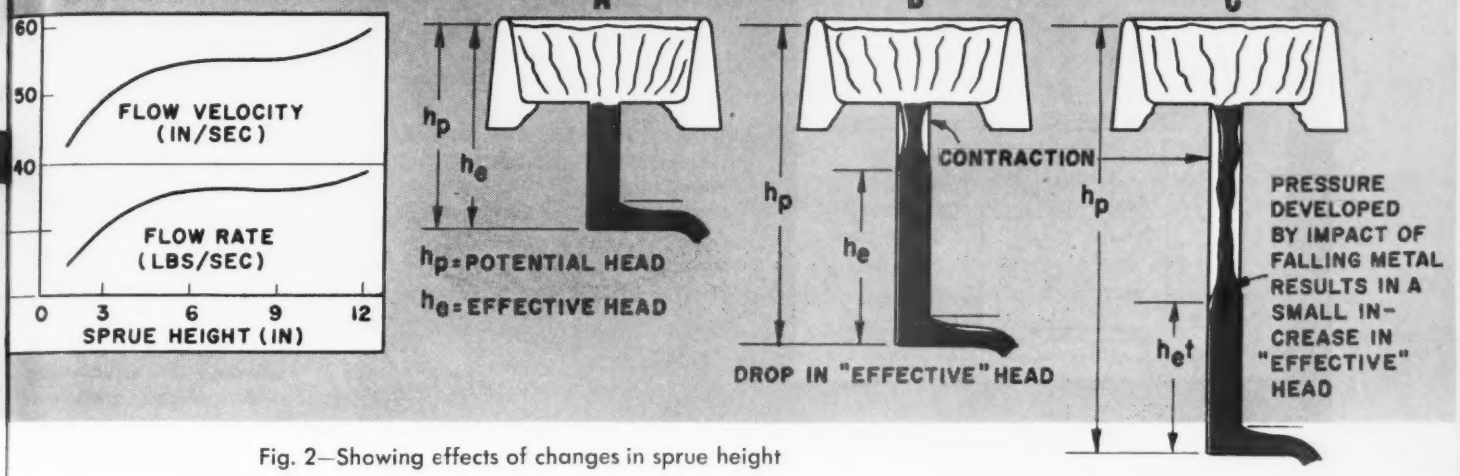

Fig. 2—Showing effects of changes in sprue height

By W. H. JOHNSON, *Metallurgist* H. F. BISHOP, *Metallurgist* and W. S. PELLINI, *Superintendent*
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oped in the fall. Usually the sprue will be partially or completely filled, in which case the flow from sprue to runner will occur primarily by the pressure head of the liquid column.

Flow through the runner and into the various ingates may occur as the result of either pressure or kinetic energy, as in the case of flow from the sprue to the runner. The design of the runner and ingates must be such as to direct flow to desired portions of the mold cavity with maximum volume rates and minimum velocities. It is important to recognize that high volume rates may be attained without the need of high velocities. Velocity, volume rate and nature of distribution of the metal may be controlled independently by proper adjustment of the geometric features of the gating system, as will be described.

For purposes of this report the stage of pouring which is concerned with flow through the pouring cup and the sprue is termed "downstage" while the stage concerned with flow in the runner and ingates is termed "distribution stage." While the "downstage" and "distribution stage" are interrelated, it is essential to a general understanding of the problem to consider the factors which determine the action of each component of the gating system as separate items. Once these are appreciated it is possible to understand the nature of the interactions which occur in the gating system as a whole.

The characteristics of flow in a gating system may change during pouring due to back pressure, which results as the mold is filled. For a gating system which is choked so as to be pressurized from the beginning of pouring the change may be relatively minor; a free system (not choked) should be expected to pressurize during pouring as the result of mold back pressure. Depending upon the design of the system, the shape of the casting and the location of the ingates (drag, parting line or cope), the nature of flow may remain relatively unchanged during the major portion of the pouring period or may change at relatively early pouring times.

From a practical viewpoint the conditions at the beginning of pouring (no appreciable back pressure due to mold) are most important to casting quality.

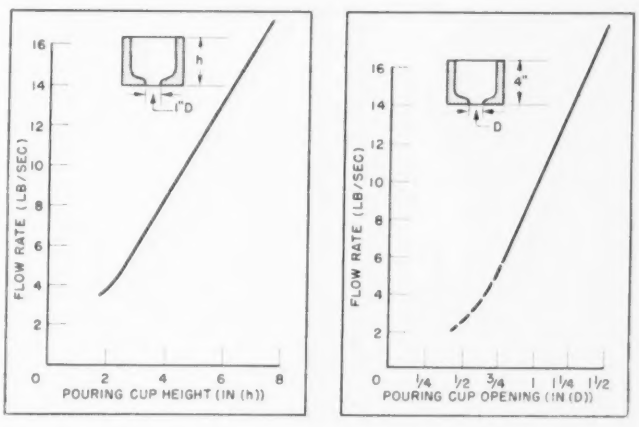
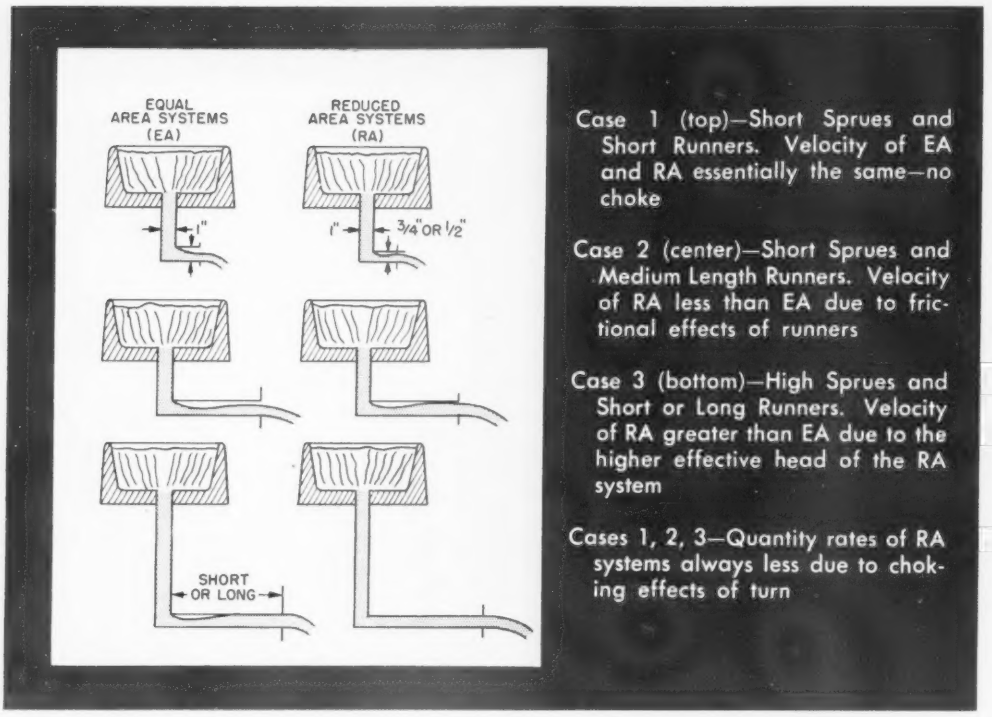


Fig. 3—These charts indicate how changes in the pouring cup height and diameter affect flow rate


EQUAL AREA SYSTEMS (EA)
REDUCED AREA SYSTEMS (RA)
1"
1"
3/4" OR 1/2"
SHORT OR LONG
Case 1 (top)—Short Sprues and Short Runners. Velocity of EA and RA essentially the same—no choke
Case 2 (center)—Short Sprues and Medium Length Runners. Velocity of RA less than EA due to frictional effects of runners
Case 3 (bottom)—High Sprues and Short or Long Runners. Velocity of RA greater than EA due to the higher effective head of the RA system
Cases 1, 2, 3—Quantity rates of RA systems always less due to choking effects of turn

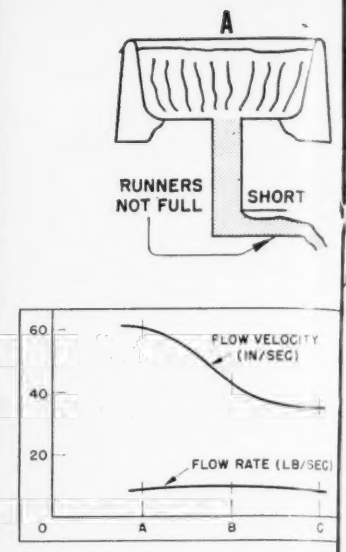


Fig. 4 (left)—Differences between the equal area and reduced area systems shown in these cases

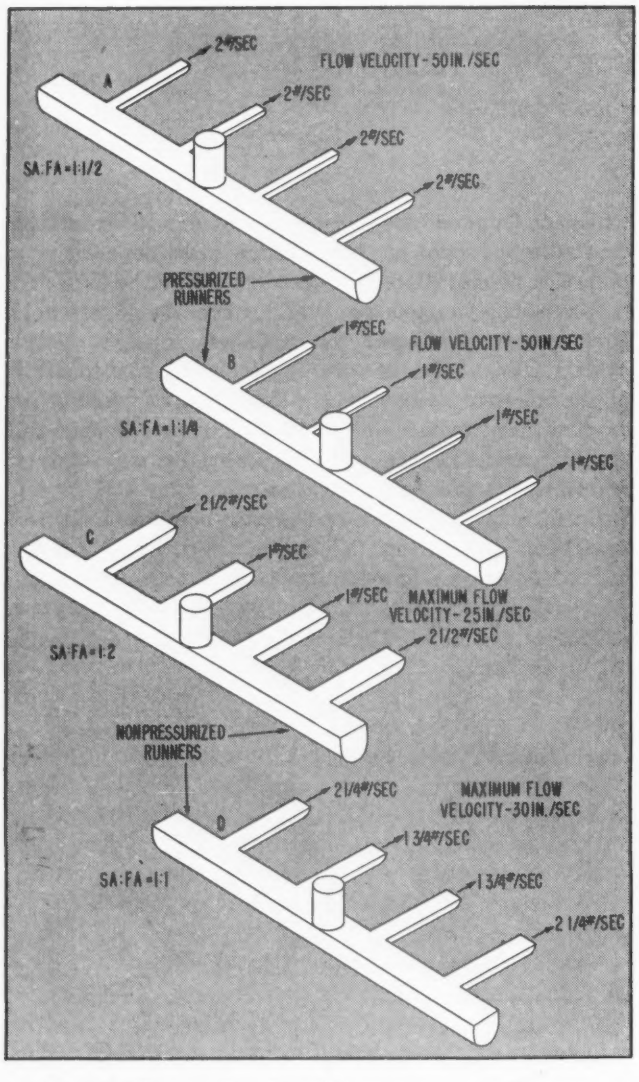


Fig. 6—Effects of reduced ingate areas. Runners *A* and *B* pressurized. *C* and *D* are non-pressurized

It is during this first stage of pouring that harmful effects such as erosion, cold shuts, drossing, etc., are most likely to occur. Because of the primary importance of the first stage period the discussions of this report center on the behavior of metal flow during the time that mold back-pressure effects are relatively minor.

Pouring Cup—The pouring cup is often considered simply as a means of assuring the entry of clean metal into the sprue by the incorporation of special features such as strainers, dams or plugs. The pouring cup, however, is of further importance in that it is the element in a gating system which determines the *maximum* volume rate at which liquid metal may be introduced into the casting. Depending on the design of the remainder of the gating system this maximum amount, or something less, may actually be delivered to the mold cavity. A flat-bottom pouring cup is essential to provide for the pressure condition required for optimum performance; cone shaped cups create a vortex condition which hinders metal flow.

If the height of metal in the pouring cup is increased, both flow velocity and volume rate of flow are increased. The variations in flow rates which may be obtained by variation in the hydraulic head in pouring cups having 1-in. diam openings are illustrated in Fig. 3 (left). Increasing height of the pouring cup by 2-in. increases the flow rate by approximately 4 lb per sec.

The quantities of metal delivered through various size openings under a 4-in. sprue cup head are shown in Fig. 3 (right). It may be noted that a $\frac{1}{4}$-in. increase in the diameter of the cup opening (in the range of $\frac{3}{4}$ to $1\frac{1}{2}$ in. diam) produces an increase in flow rate of approximately 4 lb per sec. These data are of interest in that the effect of increasing the height of the pouring cup by 2 in. is essentially equal

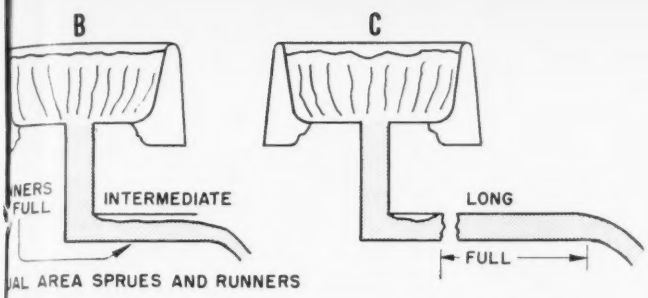


Fig. 5—How changes in runner length affect flow

to that of increasing the diameter of the pouring cup by ¼-in.

At first analysis it may seem that the sprue cup opening is more important than sprue cup height; however, the maximum amount of metal which may be delivered from cup to sprue is determined by the height of metal in the sprue cup. This follows from the fact that with the largest possible opening of the pouring cup (equal to sprue diameter), the rate of flow is determined solely by the height of the metal in the pouring cup.

Sprue and Turn—The effect of sprue height on the flow of metal in a gating system is highly dependent on conditions which exist at the turn into the runner. This fact becomes evident by considering first the effects of sprue height in the absence of a turn; i.e., the addition to the pouring cup of a sprue of uniform cross section and with an open end.

In the absence of a turn the flow rate and velocity of metal falling from the cup though a given distance is the same as free fall through the atmosphere, i.e., as if the sprue were not present. This is due to the fact that the acceleration caused by gravity produces increased velocity of fall with increasing distance from the cup opening, while the volume of flow is constant (determined by cup conditions)—therefore the stream diameter must contract, thus providing for free fall within the sprue.

The presence of a turn at the base of the sprue impedes flow and results in "piling up" of the metal so as to develop a pressure zone. The pressure developed at the turn determines the rate of flow from the sprue to the runner. The popular assumption that increasing the height of sprue increases the head of metal and, accordingly, the pressure at the sprue turn is correct only within limits. As indicated by Fig. 2, the effective head at the turn increases with increase in potential head only to the point that the maximum rate of flow from cup to sprue becomes equal to the rate of delivery from sprue to runner. When the pressure in the sprue is increased (by increasing sprue height) to a point such that the sprue delivers metal to the runner at a rate equal to the rate at which the cup can deliver metal to the sprue, further filling of the sprue becomes impossible and a contraction region remains beneath the cup opening. This prevents further appreciable increase in the sprue head since increasing sprue height past this point merely results in increasing the length of the contraction (free fall) region (Fig. 2C). The impact of the freely falling stream provides but a small increase in the effective head.

It is obvious that to cause a further increase in flow from sprue to runner it is necessary to eliminate the contraction region, and this can be accomplished only by increasing the height of metal in the sprue cup (assuming the sprue cup opening already has been made equal to the sprue diameter).

It is of interest that the sprue with a simple turn and immediate free exit (Fig. 2C condition) will develop a contraction region at sprue heights of approximately 6 to 8 in. when the pouring cup opening is equal to the sprue opening and approximately 4 in. of metal is present in the sprue cup. By raising the height of metal in the sprue cup it is possible to use higher heights of sprue and eliminate the contraction region. This increases the pressure in the sprue and results in increased flow rates into the runner.

This method of increasing flow rates deserves consideration also from the fact that the elimination of contraction regions by increasing cup heights prevents aspiration of air and drossing. The approach of tapering the sprue which is commonly used to prevent the development of a contraction region likewise is effective in preventing drossing. The two approaches differ in that the tapered sprue method relies on decreasing the rate of flow from sprue to runner while the cup height method relies on increasing the rate of flow from cup to sprue. Depending on the gating problem, availability of gate patterns, etc., one or the other may be of advantage.

Runner—The energy of the metal stream during the distribution stage is at a maximum on entry into the runner. From this point onward the problem of distribution of the metal into the mold cavity centers on the proper use of the particular type of energy available (pressure or kinetic). For a runner which remains full the energy is primarily in the form of pressure, while for a partially filled runner the energy is entirely kinetic.

Thus, it is important to consider the factors which determine whether the runner operates in a filled or partially empty condition. As in the case of the sprue the problem resolves into factors related to rate of delivery to the runner as compared to rate of exit. As a first approach consider a condition of exit equal to the runner to transport the liquid.

Fig. 5 illustrates the basic effects of increasing the length of runner for conditions such that the area of the sprue is equal to the area of the runner and the

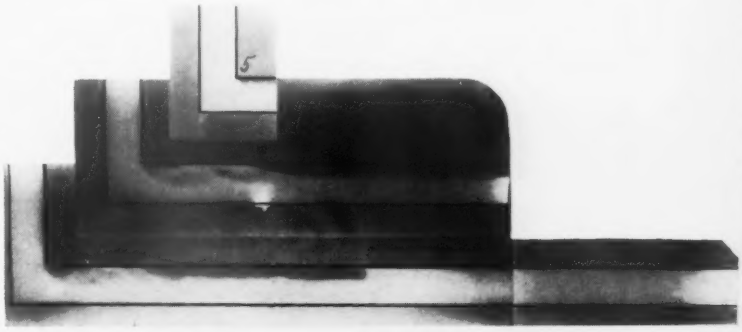


Fig. 7—Flash radiographs showing effect of runner length on flow in equal-area sprue-runner systems

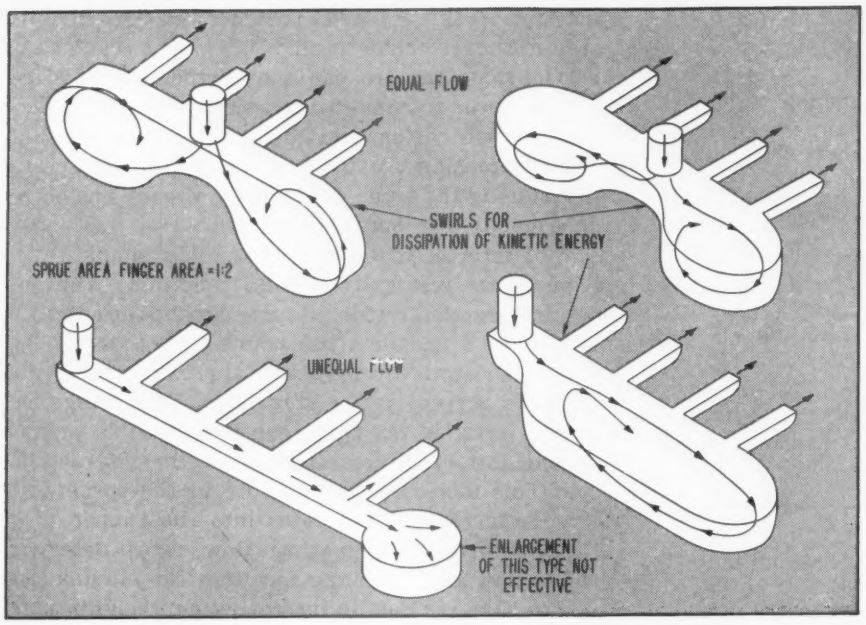

EQUAL FLOW
SWIRLS FOR DISSIPATION OF KINETIC ENERGY
SPRUE AREA FINGER AREA = 1:2
UNEQUAL FLOW
ENLARGEMENT OF THIS TYPE NOT EFFECTIVE

Fig. 8—Examples of systems used to obtain an equality of flow without use of pressurization of runner

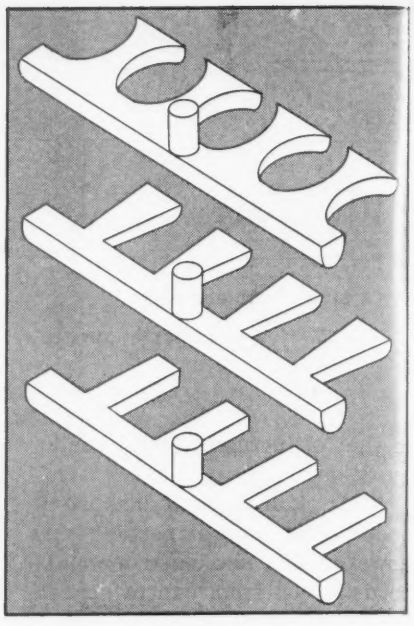


Fig. 9—Ingates that showed no advantages over simple shapes

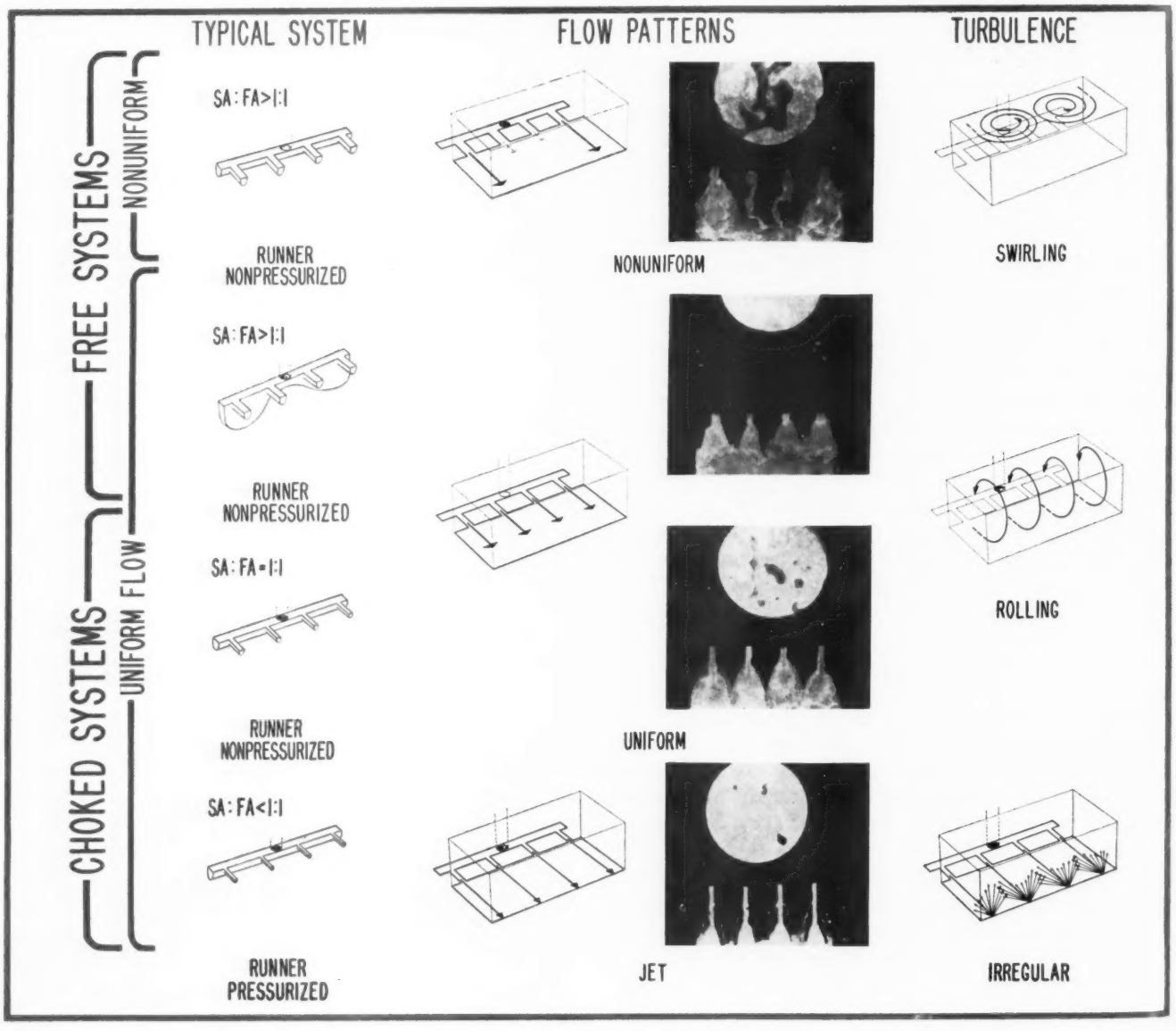


Fig. 10—Summary table of free and choked gating systems

sprue is partially or completely filled. Metal enters the runner from the sprue at a rate determined by the sprue pressure; however, the velocity decreases as the metal travels along the runner, due to friction. Since the flow into the runner remains essentially constant, a decrease in velocity along the runner length results in "piling up"—i.e., the runner becomes increasingly more full as the distance from the sprue is increased.

Fig. 7 presents radiographic evidence (flash x-ray equipment of "fraction of a second" discharge type used to "stop" the action of the liquid metal—similar to a high-speed camera) of this fact to support the indications of the flow rate data shown in Fig. 5. For equal area systems the runner becomes essentially full (except for a small area near the sprue) when the flow distance is approximately equal to 15 times the runner diameter. For practical lengths of runner the unfilled area is not eliminated entirely which signifies that the pressure developed in the filled portions of the runner must be relatively low and that kinetic energy flow predominates.

The differences between equal area and reduced area systems are illustrated in Fig. 4. Reducing the area of the runner to less than that of the sprue necessarily reduces the flow rate, and both the sprue and runner become full and pressurized. Flow velocity from the reduced runner is directly related to sprue height since the contraction region in the sprue is eliminated due to the choke condition at the turn.

Practical Effects of Runner Area

The following practical significance may be deduced from these observations:

1. If the runner is of equal or greater area than the sprue, it is not possible to develop appreciable pressurization in the runner (except by choking at the fingers).

2. If the runner area is less than that of the sprue, pressurization of the runner is accomplished in cases where total finger areas do not exceed runner areas. While for practical purposes uniform flow will occur through the fingers, a pressure drop will exist along the runner which does not permit absolute flow equality.

Ingates—A pressurized runner produces pressure on all available ingates—this is the simplest solution to the problem of developing flow from all ingates. The runner must be pressurized either by choking at the ingates or (less effectively) by reducing its area to less than that of the sprue. A runner which is not pressurized must depend on the proper use or dissipation of kinetic energy to achieve uniform distribution of liquid which is moving in a straight line path to avoid entering lateral ingates.

Examples of ingate flow from pressurized runner systems are illustrated in Figs. 6A and 6B. In all cases equal volumes of flow occur from each ingate and at the same velocity. This must be the case since equal pressure is applied to the metal at each ingate opening. If one ingate is made larger or smaller than the others, the volume of flow from the subject ingate will increase or decrease in proportion to its size relative to the remaining ingates; however, no change in velocity results since the pressure remains unchanged.

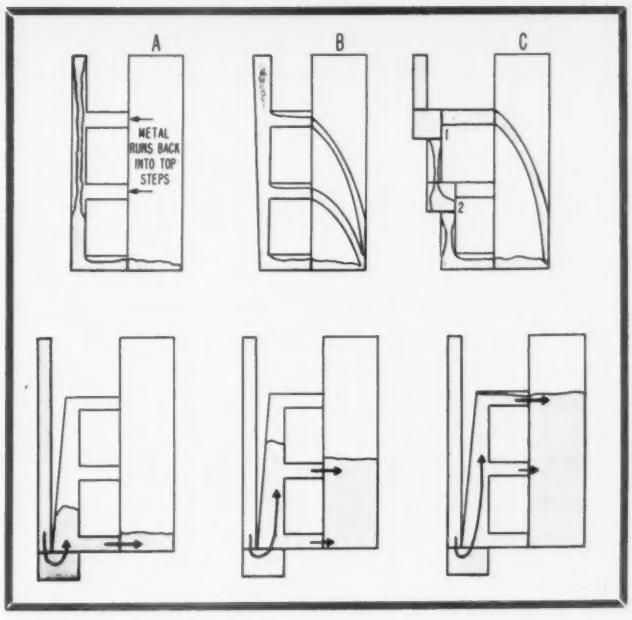
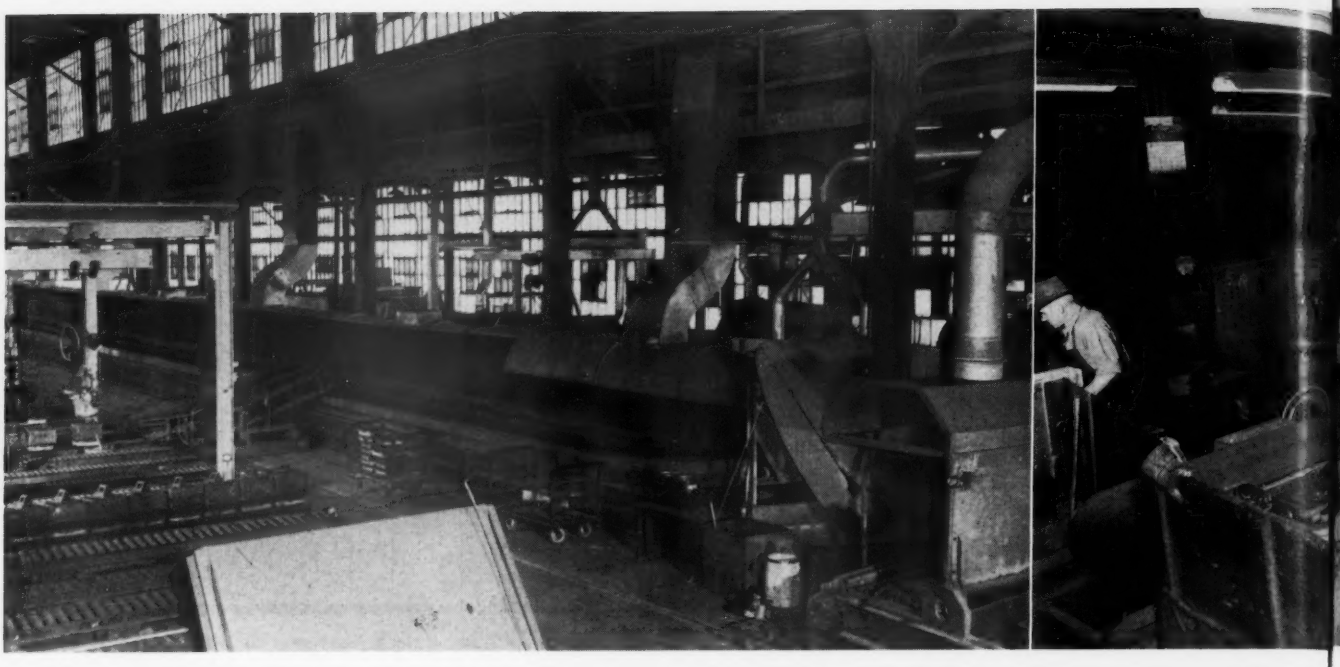


Fig. 11—Step gating systems at top function improperly. Successful system operates as at bottom

The total flow from a series of ingates in a pressurized runner system is determined by the total area of the ingate openings and the pressure head in the sprue. The total head is equal to the height of metal in the sprue to the point of contraction, if a contraction region exists, or to the height to the top of the pouring cup if the sprue is completely filled. In practice it is therefore possible to increase the rate of flow from a pressurized runner system by (1) increasing the size or number of the ingates and (2) by increasing the height of metal in the cup-sprue portion of the system. The additional flow obtained by method (2) results also in an increase in flow velocity since the pressure in the runner is increased. This is not the case for method (1).

Ingate flow from non-pressurized runner systems which distribute metal primarily by a kinetic energy process are illustrated by Figs. 6C and 6D. In each case flow is nonuniform and the ingate (or ingates) farthest from the sprue deliver the greater amount of metal and at higher velocities. The maximum velocity of flow in all cases is less than that of the pressurized types.

Various runner designs which permit distributing metal uniformly through a number of fingers without the requirement of pressurization and consequent high velocities are illustrated in Fig. 8. The common feature of these systems is the dissipation of kinetic energy by enlarging the runner so as to cause a swirl. The enlargement must be integral to the body of the runner and not an appendage to the runner. Since the rate of flow is established by the cup-sprue portion of the system, such designs develop flow uniformity without a decrease in total flow rate as is the case for pressurized systems. Because of the swirl these designs are not recommended for drossy metals for which the use of pressurized runner systems is necessary. (*Please turn to page* 271)



Molds poured on roller conveyors, left, in No. 2 foundry are dumped onto transfer conveyor, left center, which discharges to hooded apron conveyor feeding shakeout

Progressive Policies

Feature Successful Steel Foundry

By ROBERT H. HERRMANN
Associate Editor

STARTED in 1910 by the Farrell family, the Farrell-Cheek Steel Co., Sandusky, O., has developed along principles of the free enterprise system a highly efficient working team for the production of steel castings. These castings include railroad parts, stoker parts, bushings, elevator and conveyor parts, crane wheels, heavy hardware, gears, pinions and specialized, thin-section castings.

Average age of men in the supervisory organization is low. This, combined with the company policy of moving men up in the organization rather than bringing in outsiders for supervisory positions, has developed and keeps energized an optimistic, aggressive atmosphere. Production workers either are on an individual piece-rate basis or group incentive plan, which rewards them monetarily in direct ratio to their production rate. Nonproduction personnel share in company profits at the year's end. The system has developed a strong feeling of mutuality between employees and management and a realization in all personnel of direct responsibility for the success and progress of the company and for the manufacture of top quality products reflecting pride of workmanship.

Currently working on an 8-hr day, 5-day-week basis, the foundry is engaged principally in jobbing work, although it makes a line of sheaves, crane wheels, gears, gear blanks, sprockets, elevating and conveyor buckets, wire rope fittings and accessories and fabricated cast steel chain.

All production employees are required to wear protective glasses or goggles, but must make a deposit for them which is forfeited if the glasses are lost. Broken glasses, however, are replaced by the company. Gloves are furnished to workers on jobs requiring hand protection, and asbestos coats are furnished to workers requiring them in the heat treating department.

Facilities of the foundry include a first aid room staffed by a full-time nurse, a lunch room where foremen gather to eat their home-packed lunches and a commissary open to all employees. The locker room features tiled showers and stainless steel wash basins.

The foundry is well ventilated by exhaust fans in

Bench-type core blowers and hand-ram benches flanking a rubber slider belt, leading to a tower oven are pictured in this partial view of the coreroom

Castings from No. 2 foundry are cleaned in the area shown above. At left are hooded stand grinders; two airless-blast cleaning booths are visible at rear

Aerial view of the buildings comprising the Farrell-Cheek Steel Co. plant

the roof, and shakeouts and mold dump conveyors are hooded and vented to a wet-type dust collector.

Two sections comprise the foundry. The snap flask section, known as No. 2 foundry, is equipped with 15 jolt-squeeze molding machines which handle flasks up to 18 in. square. Sand is plowed off an overhead distribution belt into hoppers servicing each machine. Patterns, cores, skim gates, nails and other supplies needed by the molders are delivered by small gasoline truck and placed on a bench near each molding machine. Surplus supplies are stacked on racks against the wall on the other side of an aisle from the machines.

Completed molds are set off on wooden bottom boards on gravity roller conveyors, extending behind the molding machines and raised about 18 in. off the floor. Dry sand pouring basins are placed over the mold sprue holes. Molds are poured from 200-lb capacity ladles suspended from an overhead monorail. Molten steel is delivered to these ladles by a 5-ton bull ladle mounted on an electric car which travels on rails in the floor. On the same rails rolls a hand-pushed apron conveyor transfer car. When molds are ready for dumping, the car is positioned at the end of one of the roller conveyors and the molds pushed off to the transfer conveyor. Bottom boards are carried back to the molders while the electrically driven transfer conveyor carries the sand

and castings up a slight incline and discharges into a second, waist-high apron conveyor which feeds a vibrating shakeout.

Castings are hooked from the shakeout to a large bucket placed in a floor pit just in front of the shakeout. This pit is equipped with grating type doors which close over the top of the pit when shakeout operations are not in progress.

Sand falls through the shakeout to an underground apron conveyor and is carried to a bucket elevator, which raises it above the muller sand storage hoppers. From the elevator the sand passes through a screen to a belt conveyor and thence over a magnetic pulley into chutes to three hoppers. Each of the two mullers is supplied by its own 50-ton hopper or by a central 100-ton hopper through chutes. These are manually controlled, 1-ton capacity mullers. Western bentonite and cereal additions are made by volume in amounts necessary to achieve desired sand properties. Water is metered, and sufficient quantity is added to achieve a moisture content of 3 to 3.4 per cent. About 12 laboratory sand tests are made daily on samples taken from various molding stations, so that accurate control is maintained at all times.

Sand is discharged from the mullers to a chute, which feeds a bucket elevator. At top of the elevator sand is deposited in a fluffing and aerating device and thence to the 24-in. overhead distribution belt. Sand not plowed off into molders' hoppers flows over the end of the belt to a chute leading to a below-floor-level return belt, which passes under the floor gratings around the molding machines, gathering spilled sand. Its contents are spilled into the apron conveyor carrying sand from shakeout.

Facing sand is used on all molds and is mixed in a small muller in the area. It is made up of half new and half old sand with Western bentonite, cereal and water in quantities to obtain desired characteristics for each job.

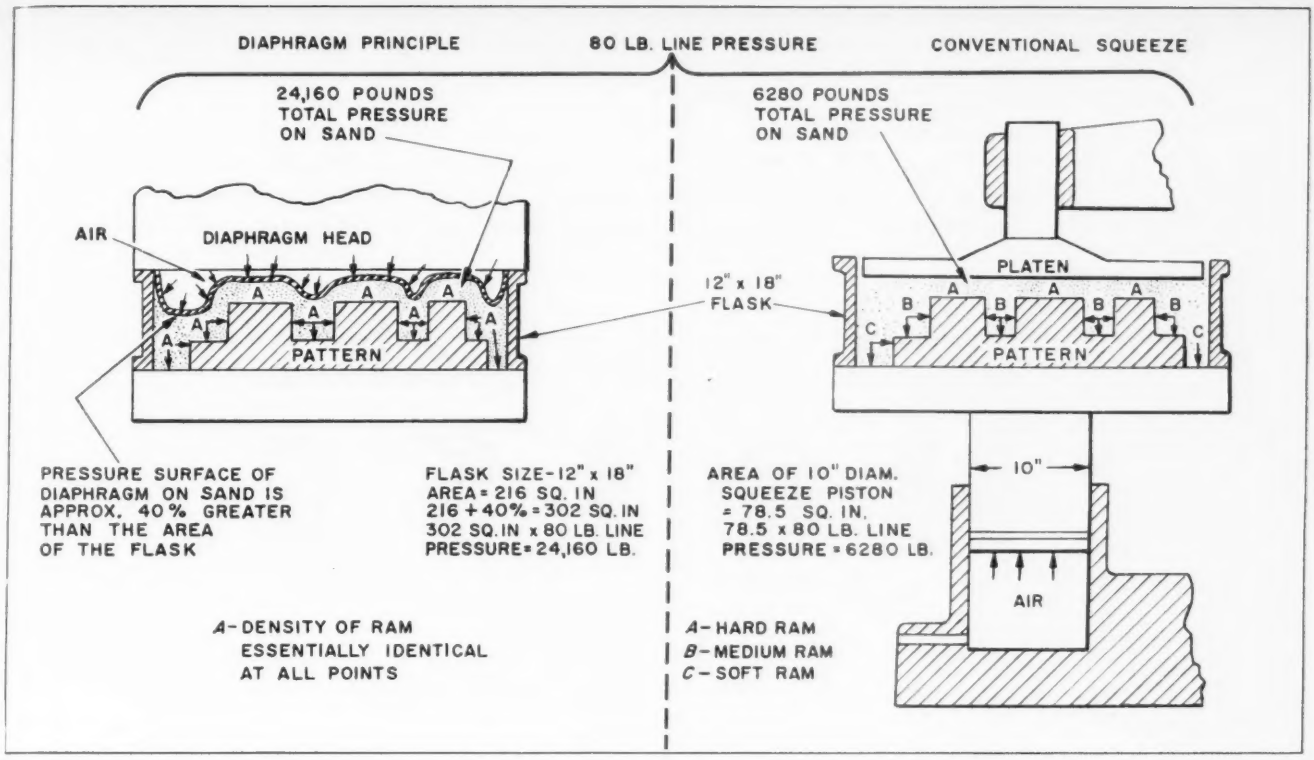
Buckets, loaded with castings from the shakeout are removed from the pit by electric hoist mounted on a bridge crane and hauled by gasoline platform lift trucks to the cleaning room behind the mold dump apron conveyor.

Here gating systems are removed by various means including sledge hammer, power shear, acetylene flame cutter or swing grinder. Other cleaning room equipment includes an airless blast, tumbling unit, five double-end stand grinders, several pneumatic chipping hammers, and a number of welding machines for repair and fabrication welding. Currently going through the shop are several units consisting of two cast parts which are welded together to form the completed unit. For this purpose, jigs are used to hold the parts in correct position for welding. Chipping and grinding operations are performed after welding.

Inspections are conducted during and after cleaning and welding, and the castings are tossed into large buckets for transportation by gasoline platform lift trucks to the heat treating (*Please turn to page* 262)

A typical example of the specialty type castings produced from one of the company's many steel alloys

Castings from both the foundries are annealed in car-type furnaces, some of which are shown below


DIAPHRAGM PRINCIPLE
80 LB. LINE PRESSURE
CONVENTIONAL SQUEEZE
24,160 POUNDS TOTAL PRESSURE ON SAND
AIR
DIAPHRAGM HEAD
PATTERN
PRESSURE SURFACE OF DIAPHRAGM ON SAND IS APPROX. 40% GREATER THAN THE AREA OF THE FLASK
FLASK SIZE-12" x 18"
AREA = 216 SQ. IN
216 + 40% = 302 SQ. IN
302 SQ. IN x 80 LB. LINE PRESSURE = 24,160 LB.
A-DENSITY OF RAM ESSENTIALLY IDENTICAL AT ALL POINTS
6280 POUNDS TOTAL PRESSURE ON SAND
12" x 18" FLASK
PLATEN
PATTERN
AREA OF 10" DIAM. SQUEEZE PISTON = 78.5 SQ. IN.
78.5 x 80 LB. LINE PRESSURE = 6280 LB.
10"
AIR
A-HARD RAM
B-MEDIUM RAM
C-SOFT RAM

Illustrating the principle of operation of the diaphragm head in applying squeeze

Recent Developments in HIGH-PRESSURE MOLDING

By TOM BARLOW and W. R. ADAMS
Eastern Clay Products Department
International Minerals & Chemical Corp., Chicago

DEVELOPMENT and research in pressure molding are now sufficiently integrated to permit a specific definition of the process. Previously such a definition was possible in only the most vague terms because many details were still unknown. The entire story was confusing because of the necessity for emphasis on sand properties and the necessity for using a variety of make-shift equipment.

We can now define pressure molding as a molding process in which molding pressure, sand flowability and mold shape are regulated to produce green sand mold density capable of reproducing pattern dimensions with extreme accuracy and uniformity.

The important philosophy of this process lies in the need to relate three definite factors: 1) Sand flowability, 2) molding pressure and 3) mold shape (including flask clearance and sand bearing surface).

High-pressure molding may involve 600 psi pressure or less than 100 psi pressure, depending upon the pattern, the molding technique and the sand. In this regard, it is important to discuss mold density rather than mold hardness. Mold hardness is not related completely to precision molds and castings. We have seen many instances of two molds showing approximately the same hardness but with widely different results in final casting tolerances. Mold density, on the other hand, refers to the over-all orientation of sand grains within the mold cavity and is related directly to finish and tolerance.

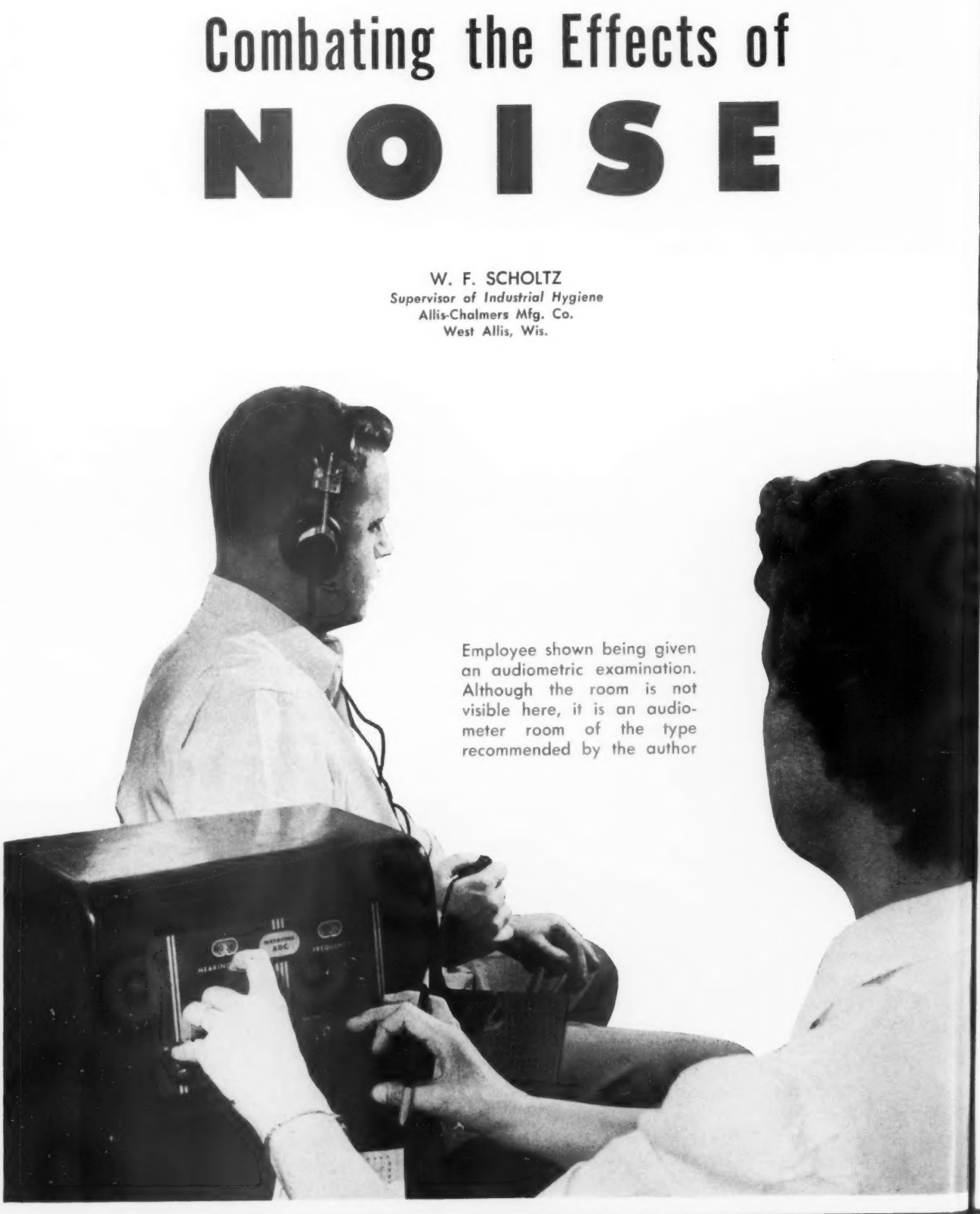
Patterns and Flasks—It is difficult to choose a starting point when trying to correlate three related phenomena of equal importance. We will start with pattern and flask equipment. One weakness in many operations, when judged from the standpoint of dimensional tolerances, is a tendency to mount patterns in flasks which are too small for the job. This usually results from a desire to save sand or weight in the flask. It makes the job difficult for two reasons.

Anyone who has ever rammed a mold knows how difficult it is to develop a dense, hard mold when the pattern is close to the flask wall. Side-wall friction restricts the flow of sand under such conditions unless the molder offsets the effect by hand operations such as peening and tucking. Hand-operations, however, are not sufficiently reliable for precision casting. On the other hand, provision for adequate sand flow by proper flask sizing, permits mold density to be developed with reasonable pressures. So we see the first instance of the correlation between patterns and pressure with a broad hint that (*Please turn to page* 257)

Originally presented earlier this year as a paper at the seventeenth annual Wisconsin Regional Foundry Conference in Milwaukee, this article points out that sound can cause hearing impairment and goes on to discuss some of the preventive measures that can be taken in . . .

Combating the Effects of NOISE

W. F. SCHOLTZ
Supervisor of Industrial Hygiene
Allis-Chalmers Mfg. Co.
West Allis, Wis.



Employee shown being given an audiometric examination. Although the room is not visible here, it is an audiometer room of the type recommended by the author

INTEREST in the industrtial hearing field has been increased by the fact that exposure to sound under certain conditions has been found to cause some hearing impairment. This interest has been reflected in both management and labor circles. The problem has been complicated further by a sudden increase in the number of claims filed for industrial hearing loss presumably caused by exposure to high intensity sound.

To date, most studies merely have outlined the major uncertainties which make the establishment of standardized tests and measurements difficult.

Fortunately, a great deal of valuable preliminary study was done at Allis-Chalmers which made it possible to set tentative standards and to chart a course for a program, which it is hoped ultimately will bring us toward the control of the noise problem.

Briefly, what this preliminary study consisted of is as follows: As far back as 1948, under the guidance of the late Dr. Grove, we were able to take the initial steps toward an industrial hearing conservation program. Dr. Grove was chairman of the subcommittee on noise and industry of the committee on conservation of hearing of the American Academy of Ophthalmology and Otolaryngology. Instruments to make sound-level studies were acquired, and personnel were trained in their use. Surveys were made of various industrial operations and used as a basis for future studies. Audiometric instruments were added later, and examinations of personnel were begun.

As a result of the experience gained in the basic studies, the company was able to develop a program designed to move toward ultimate control of the problem. For anyone interested in starting a program to combat the effects of noise, the following steps merit consideration:

Step I: Plant Surveys—First of all, a spot check of the plant should be made with a sound-level meter to see how much noise there is in the plant and where it is. When locations are found where the noise level is 95 decibels or more, a program of audiometric examinations may be in order. These spot checks should be followed by a complete sound-level survey of the plant. After the plant is surveyed, a sound-band analysis should be made at locations where sound-level readings above 95 decibels were obtained. These data will be particularly helpful in planning a noise abatement program. Thereafter, periodic followup surveys should be made. All new, repaired or transferred equipment also should be checked.

A level of 95 decibels has been accepted only as a starting point for our sound-band analysis study and does not establish a level at which hearing loss begins.

Step II: Audiometric Examinations—All new employees should be given a pre-employment audiometric examination. For *statistical* purposes, it is desirable to take an audiogram on a pure-tone audiometer in the frequency range of 125 to 12,000 cycles. Ordinarily, the range of 250 to 8000 is used. It is also important that the age, sex and occupation of the employee be recorded. The previous work history is important and should reveal the operations he was exposed to in the past. For example, did he work as a milling machine operator, a ribbon salesman or as a boilermaker's helper? What was his opinion of the noise level where he worked? Did he think it was noisy? Could he carry on a conversation without difficulty?

Any military service record also should be recorded, specifically stating what branch of the service he was in, what he did and for how long. For example, was he a machine gunner, an MP, an office worker, a radar operator, etc.?

Next, he should be asked whether his hearing is good. This question can be answered either yes or no. He then can be asked, "Can you hear over the telephone, in a theatre, in a single conversation or group conversation?" It is desirable to know if he is using a hearing aid and, if so, for how long he has used it.

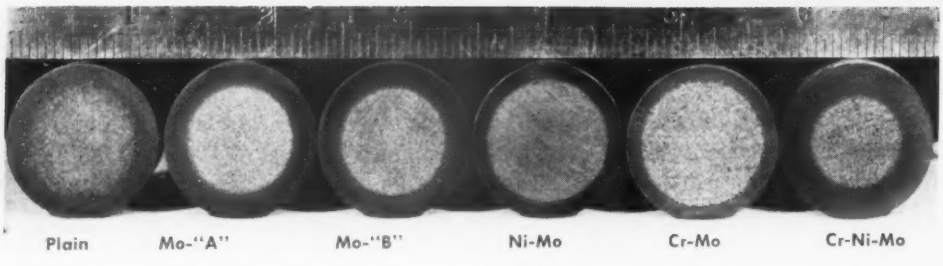
Another important question is, "Do you, or have you ever, used ear protection?" It can be followed with questions about how frequently he has used such protection and what type it was. It is interesting to note that in the latter respect, some of the answers we received include items like oil soaked cotton or dry cotton. Some men used .32 caliber shells, round-headed screws, gum and even rubber erasers.

It may seem that the value of this type of data is questionable, but at least for the present we feel that it is important for research purposes.

The employee also should be given an otoscopic examination to exclude present ear discharge or wax. This should be done by the examining doctor.

It may be interesting to know that a check of over 6000 pre-employment audiograms revealed that 27 per cent of Allis-Chalmers' new employees had some type of audiometric loss. Dr. Wheeler, the field representative of Dr. Grove's subcommittee, found approximately the same percentage in his work. Of course, this figure represents only hearing losses found in an industrial segment in the Milwaukee area. It probably will be different for the general population and may vary considerably with geographical locations.

New employees going into areas where sound level readings are above 95 decibels should be rechecked before their probationary period has ended (in many plants this is three months) and then again six months after this examination. Thereafter, they should be re-examined yearly. I would like to emphasize that the figure of 95 decibels, as previously mentioned, (*Please turn to page* 186)



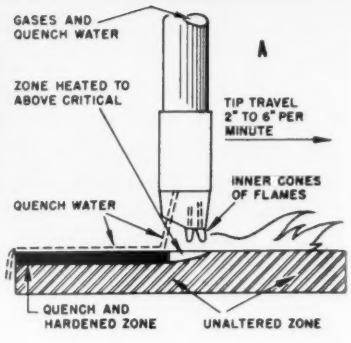


Fig. 1—Comparison of the hardenability of various plain and alloy gray irons. Compositions of the irons are shown in Table I and hardness values in Table II

Flame Hardening of Gray Ir

This article comprises another section of a manual being prepared by the Gray Iron Founders' Society on heat treatment of gray iron. It discusses one method of improving wear resistance and strength

IN PREVIOUS sections (FOUNDRY, December, 1953, January, 1954) the use of heat treatment to relieve stresses and soften gray iron to promote machining has been described. However, one of the chief and most valuable uses of heat treatment of any ferrous material is to improve other physical properties, including wear resistance and strength.

The possibility of improving these properties rests on the fact that gray iron, like steel, exists in two atomic crystal (allotropic) forms, depending on the temperature to which it is heated. That is, above a temperature or temperature range referred to as the critical or transformation temperature (above about 1400° F for the usual gray iron) the iron exists in the gamma or austenitic form and is capable of absorbing 0.80 per cent or more carbon in solid solution. (See later description of method for calculating critical temperatures in various gray irons.) Below this transformation temperature the iron reverts to an alpha form, the natural structure of iron at room temperature, in which carbon is practically insoluble.

This very drastic structural change accompanying the gamma (austenite) to alpha transformation, and the ability to depress the temperature of this gamma to alpha change to comparatively low temperatures on rapid cooling, permits the structure of the iron to be altered in various ways, i.e., the iron to be hardened, and special properties developed.

Very briefly, the essential steps to produce altered physical properties and/or improved wear resistance involves heating a casting or section of a casting above the transformation temperature, usually to a minimum of 1500° F and cooling it at a rapid enough rate so that the normal conversion from gamma to alpha iron, is depressed to a temperature between 200 and 400° F, which is considerably below the temperature at which the transformation would normally occur, and a martensitic structure is formed. Under normal circumstances this critical or rapid cooling rate is produced by some type of quenching of the heated piece in water, oil, or a similar medium. A number of intermediate structures can be obtained with other cooling rates or isothermal transformations, but in general the optimum structure for maximum wear resistance is the martensitic and in general maximum physical properties are based on producing this structure followed by tempering.

The analysis of the gray iron or other ferrous material directly affects its response to heat treatment, particularly as concerns the position of the transformation temperature and the cooling rate necessary to produce the required martensitic structure. For example, two of the essential conditions are that the part being heat treated contain sufficient carbon in solution before cooling and that it contain a balance of alloying elements designed to facilitate the heat treatment reactions. It is fortunate that gray iron contains a carbon content more than sufficient to result in an optimum reaction to any hardening operation and, of course, alloys can be added to gray iron in the same manner as to other ferrous materials to intensify hardenability. The term "hardenability" is used here to denote the ability of the iron to develop a martensitic structure to a maximum depth and does not refer to the intrinsic hardness of the iron after heat treatment. The most desirable structures and compositions for special heat treatments are described later in detail.

It is possible either to harden a casting through its entire thickness or to selectively harden the outside or other portions of the iron which need to attain

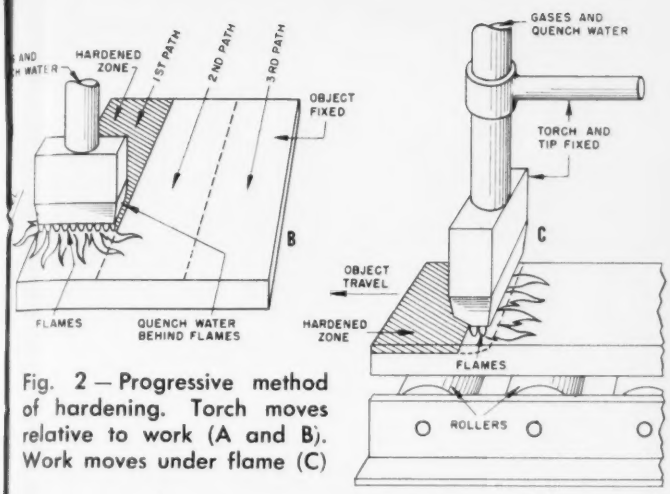


Fig. 2 — Progressive method of hardening. Torch moves relative to work (A and B). Work moves under flame (C)

ayIron Castings

By CHARLES O. BURGESS

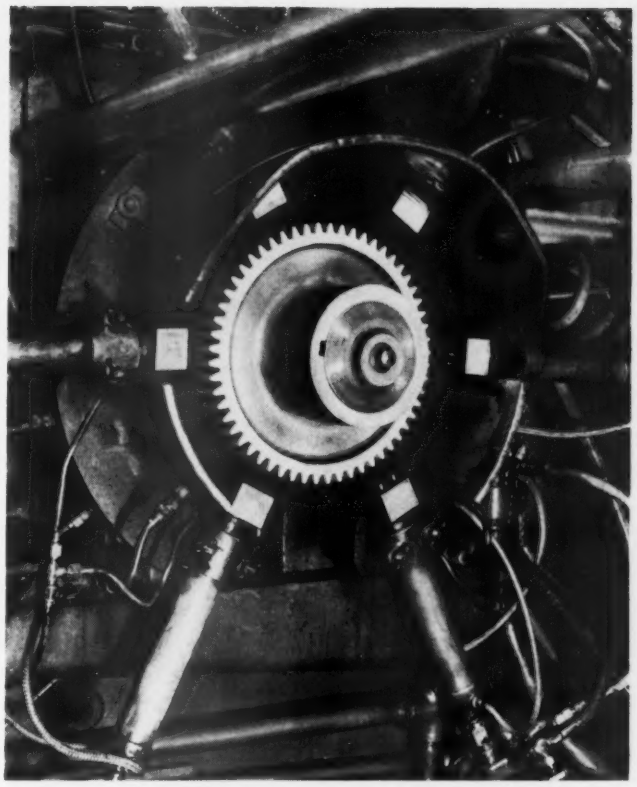


Fig. 3—Equipment for flame hardening of gears

maximum wear resistance. To resist wear the combination of a martensitic structure plus graphite, which gives one of the most wear-resistant types of material known, is generally desired.

This article will discuss only flame hardening. Other hardening methods will be treated in subsequent issues.

Surface Hardening—In most cases where increased wear resistance of a gray iron casting is desired, simply hardening the surface layer is sufficient to produce the desired result, since wear takes place only at the surface. Furthermore, in some instances

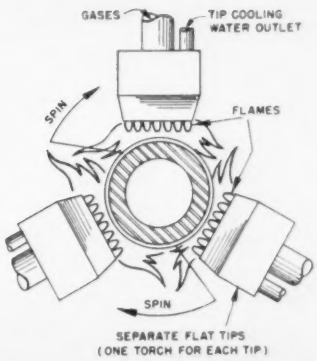


Fig. 4—Progressive spinning of a long, cylindrical casting

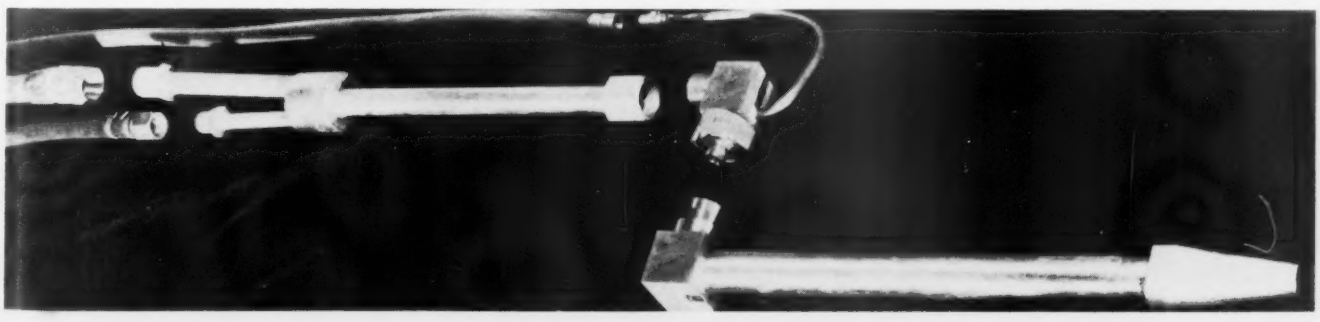


Fig. 5—Disassembled, air-cooled oxyacetylene flame-hardening torch rated 600 cu ft of acetylene per hour

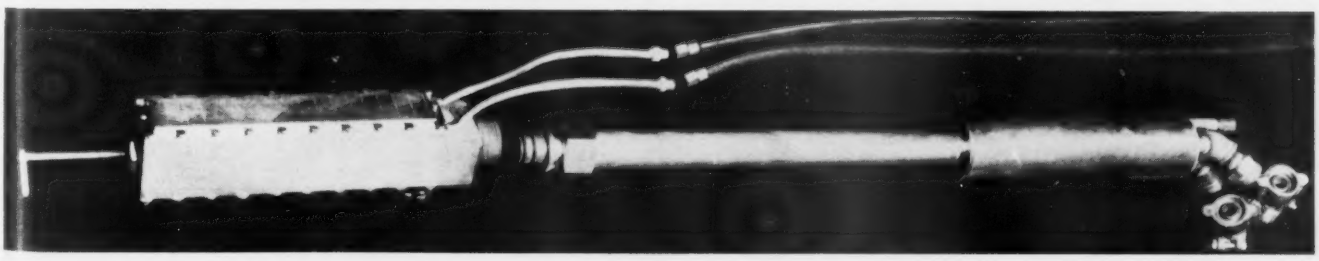


Fig. 6—Disassembled, water-cooled oxyacetylene flame-hardening torch rated 2250 cu ft of acetylene per hour

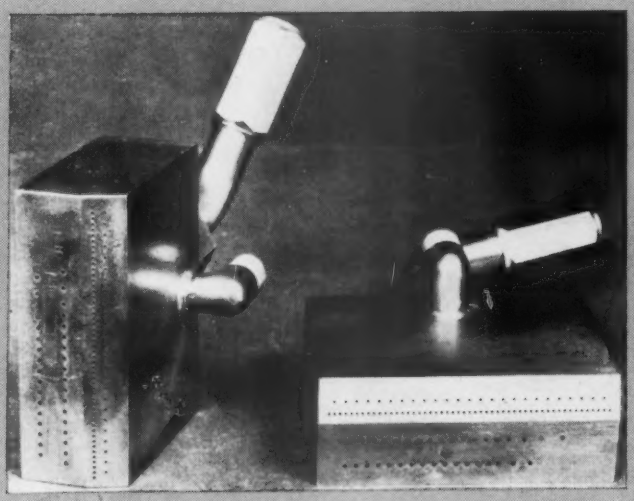


Fig. 7—Water-cooled tips for progressive hardening. Holes on slanted surface used for the quench

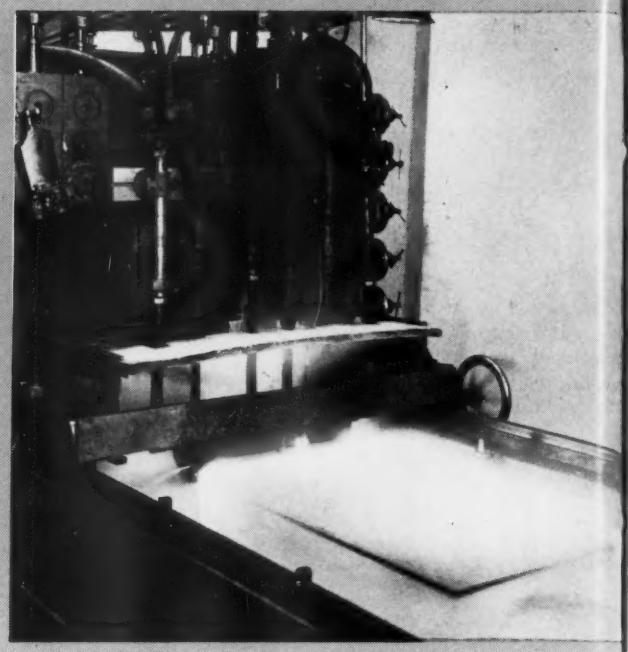


Fig. 8—Multiple torches and composite tip being used to harden an area 16 in. x 5 ft in one pass

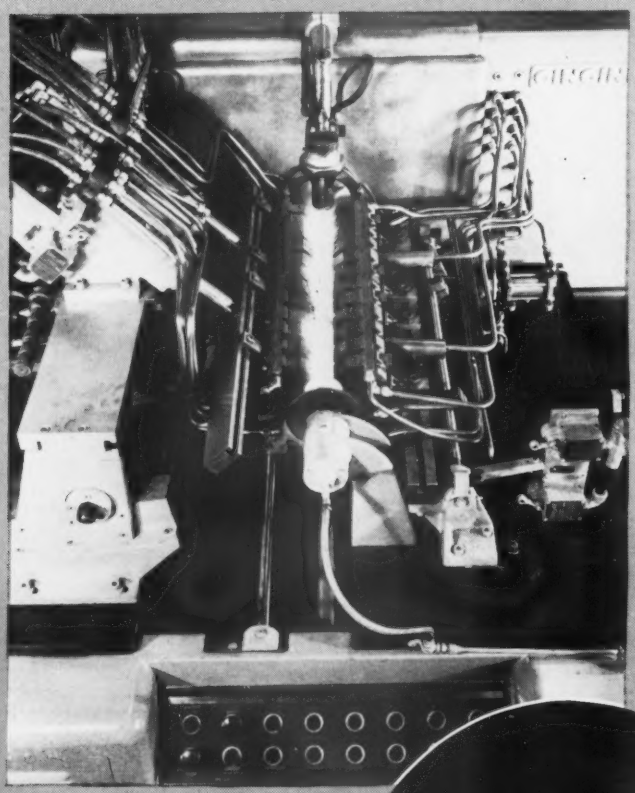


Fig. 9—Fully automatic hardening of alloy gray iron crankshafts. Machine being used is that shown in Fig. 10

Fig. 10 (below)—General view of modern flame-hardening machine. Used principally for hardening by spinning, it is adapted to progressive and stationary jobs

Fig. 11 (left)—Cross section of the hardened camshaft shown in Fig. 9. These camshafts receive a ½-in. case and a 50 Rockwell C surface hardness

TABLE I—Composition of Gray Iron Cylinders

	Plain	Mo-A	Mo-B	Ni-Mo	Cr-Mo	Cr-Ni-Mo
Total Carbon	3.19	3.22	3.20	3.22	3.21	3.36
Combined Carbon	0.69	0.65	0.58	0.53	0.60	0.61
Silicon	1.70	1.73	1.76	2.02	2.24	1.96
Manganese	0.76	0.75	0.64	0.66	0.67	0.74
Chromium	0.03	0.03	0.005	0.02	0.50	0.35
Molybdenum	0.013	0.47	0.48	0.52	0.52	0.47
Nickel	...	...	trace	1.21	0.06	0.52
Phosphorus	0.216	0.212	0.187	0.114	0.114	0.158
Sulphur	0.097	0.089	0.054	0.067	0.071	0.070

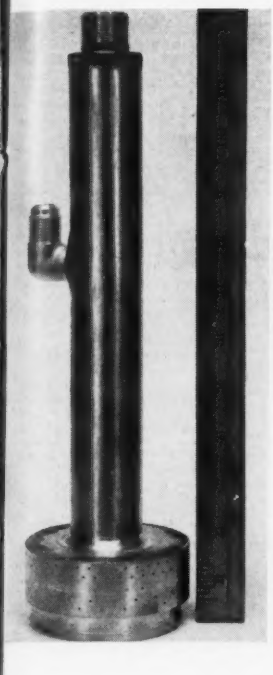


Fig. 12—This special tip is used to harden internal cast rounds

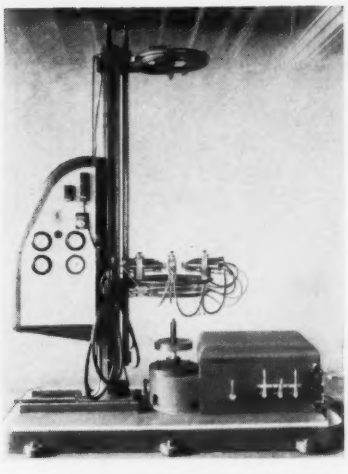


Fig. 13 — Versatile flame-hardening machine used on gray iron

because of considerations of size or shape it is actually undesirable or impracticable to harden the entire casting, and surface hardening is the only method by which a wear-resistant part may be produced economically.

In flame hardening, the most common type of surface hardening applied to gray iron, the outer layer of a casting is heated to a temperature above the tranformation range and then rapidly cooled, almost always by quenching, to promote the formation of martensite. The casting after treatment consists of a hard, wear-resistant outer layer and a core of softer gray iron which during treatment did not reach a temperature above the transformation point. In fact, the unhardened part, immediately below the hardened layer which has been heated to some extent by the flame, even may be partially annealed. Because the hardened outside layer is of higher strength, and compressive stresses can be induced, there may be some improvement in fatigue properties, as well as in wear resistance.

The advantages of flame hardening as a process are apparent. By this process the surface of the casting may be rendered hard and wear resistant where desired, while the major portion of the part retains the advantageous shock-resistance and machinability of unhardened gray iron. The internal stresses introduced by flame hardening are usually less than those produced by "through hardening" in which the entire casting is heated above the transformation temperature.

As a further advantage it sometimes may be necessary or desirable, especially with large castings such as machine tool beds, to harden only a relatively small section of the surface such as the bed-ways.

Recommended Composition—Both plain and alloy gray irons can be flame hardened successfully. However, some compositions yield much better results than others, and an effort should be made to obtain castings with the optimum flame-hardening characteristics consistent with other requirements.

One of the most important factors in this regard is the combined carbon content. The time at which the part to be hardened is held above the transformation temperature is of necessity quite short, preferably as short as possible, and carbon should be present in a form which will dissolve readily in iron at high temperature—that is, iron in the austenitic or gamma form. One of the most soluble forms of carbon is the lamellae of combined carbon in pearlite,

Fig. 14—Fine martensite produced by hardening at proper temperature

Fig. 15 — Coarse martensite caused because flame temperature too high

Fig. 16—White iron resulting from heating near melting point of iron

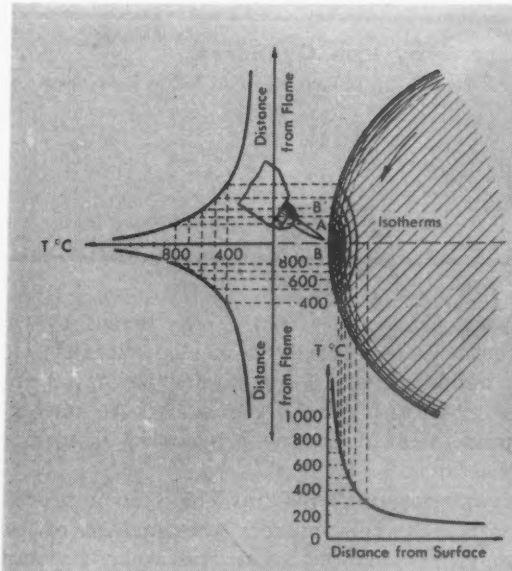


Fig. 17 — Illustrating temperature conditions immediately underneath the torch. Temperatures shown in degrees centigrade

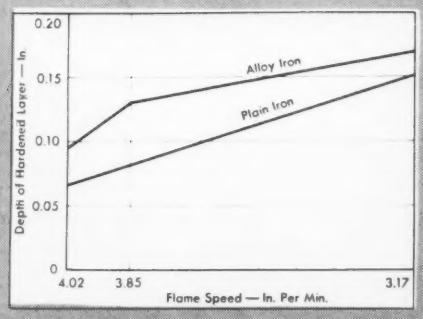


Fig. 18—Relation of travel speed to depth of hardened layer for plain and alloyed iron. Alloy here is nickel

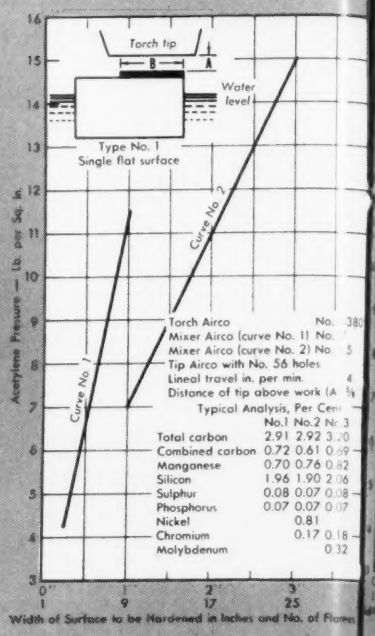

Torch tip
B
A
Water level
Type No. 1
Single flat surface
Curve No. 2
Curve No. 1
Acetylene Pressure — Lb. per Sq. In.
Torch Airco No. 380
Mixer Airco (curve No. 1) No.
Mixer Airco (curve No. 2) No. 5
Tip Airco with No. 56 holes
Lineal travel in. per min. 4
Distance of tip above work (A
Typical Analysis, Per Cent
No.1 No.2 No. 3
Total carbon 2.91 2.92 3.20
Combined carbon 0.72 0.61 0.69
Manganese 0.70 0.76 0.82
Silicon 1.96 1.90 2.06
Sulphur 0.08 0.07 0.08
Phosphorus 0.07 0.07 0.07
Nickel 0.81
Chromium 0.17 0.18
Molybdenum 0.32
Width of Surface to be Hardened in Inches and No. of Flame

Fig. 19—Recommended acetylene pressure for use in flame hardening large areas

which in a pearlitic iron may account for up to 0.55 to 0.70 per cent C or approximately the maximum amount of carbon soluble in austenite just above the transformation temperature. Therefore, an iron with a high percentage of pearlite—an iron with a combined carbon content of 0.5-0.7 per cent—is recommended, although irons with as little as 0.4 per cent combined carbon can be flame hardened. In general, it is not recommended that more than 0.8 per cent of the carbon be present as combined carbon or iron carbide, as such irons, that is, mottled or white irons, may tend to crack on surface hardening.[1,2,3,4,5,6]

The remainder of the carbon—over about 0.55-0.70 per cent in gray irons—will be present as graphite flakes, which dissolve in austenite much more slowly than pearlitic carbide does. For maximum hardness, it is advisable to employ an iron containing as small an amount of total carbon as is consistent with the production of sound castings free from any danger of cracking.[1,3,5] The coarse graphite flakes typical of a high-carbon iron not only interfere with the flame hardening operation but should also be avoided since they may be burned out during flame heating, thereby producing a porous and unattractive surface.[5]

Since high silicon promotes the formation of graphite and of a low combined carbon content, a relatively low silicon content also is advisable. A number of operators report that the silicon content should not exceed 2 per cent in any iron submitted to a hardening operation. They likewise recommend that the manganese be held in the range of 0.80 to 1.00 per cent so that this latter element contributes to the hardening action.[62,63]

Gray iron to be flame hardened should be as free as possible from porosity and foreign matter such as sand or slag, because even small inclusions of such materials tend to produce a rough surface after hardening.[7] Since skin or scale on the surface acts as a heat insulator which would render the flame hardening process less effective, rough casting surfaces particularly should be blasted prior to heat treatment.[8]

Effect of Alloys—In general, alloyed gray irons can be flame hardened with greater ease than unalloyed irons. Partly, this is because alloy irons can be heat treated successfully over a wider temperature range, thus minimizing the necessity for exact pyrometric control.[9] Also the hardenability, or depth of the martensitic layer, is increased by the addition of most alloying elements.[10]

In some cases the final hardness also may be increased by alloying additions. The maximum hardness obtainable by flame hardening a plain gray iron with approximately 3.0 per cent total C, 1.7 per cent Si and 0.60 to 0.80 per cent Mn ranges from 400 to 450 brinell. This is due to the fact that the brinell hard-

TABLE II—Rockwell C Hardness of Cylinders

	Surf.	1/32"	1/16"	3/32"	1/8"	5/32"	7/32"	9/16"
Plain iron ...	45	49	47	40	20–39	20	18	16
Mo-A	55	55	54	54	32–50	32	16	16
Mo-B	56	55	54	54	50	30–48	18	18
Ni-Mo	52	51	50	44	40	19	19	19
Cr-Mo	53	53	52	32–49	18–32	18	18	18
Cr-Ni-Mo ...	52	52	52	54	53	52	31	17

TABLE III—Gas Consumption

Depth, in.	Speed, in./min	Coverage, sq in./min	Acetylene, cu ft/sq in.	Oxygen, cu ft/sq in.
1/32	2	8	.55	.61
1/16	3	12	.37	.40
1/8	4	16	.28	.30
1/16	5	20	.22	.24
1/8	6	24	.18	.20

TABLE IV—Brinell Hardness Values

Analysis	Bhn Measured at Various Depths Below Surface: Surf.	1/32"	1/16"	3/32"	1/8"	5/32"
3.46% TC, 0.76% CC,* 1.58% Si, 0.14% P	535	585	590	480	230	205
3.44% TC, 0.77% CC,* 1.70% Si, 0.3% P	525	605	610	525	220	220
3.30% TC, 0.73% CC, 1.44% Si, 1.43% Ni, 0.80% Mo	450	560	605	585	355	255

* Certain authorities recommend that phosphorus be held at the lowest practical level to avoid brittleness on the hardened layer.

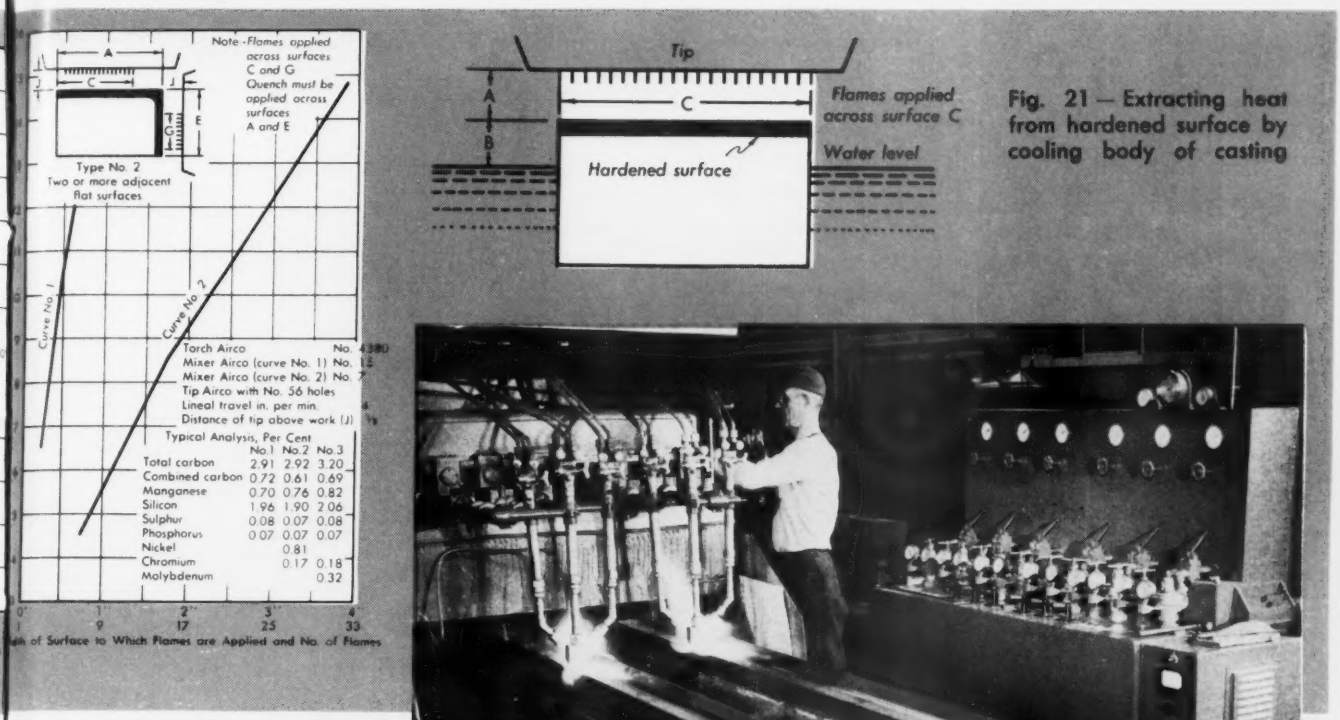

Note - Flames applied across surfaces C and G. Quench must be applied across surfaces A and E
Type No. 2
Two or more adjacent flat surfaces
Curve No. 1
Curve No. 2
Torch Airco
Mixer Airco (curve No. 1) No.
Mixer Airco (curve No. 2) No.
Tip Airco with No. 56 holes
Lineal travel in. per min.
Distance of tip above work (J)
Typical Analysis, Per Cent
No.1 No.2 No.3
Total carbon 2.91 2.92 3.20
Combined carbon 0.72 0.61 0.69
Manganese 0.70 0.76 0.82
Silicon 1.96 1.90 2.06
Sulphur 0.08 0.07 0.08
Phosphorus 0.07 0.07 0.07
Nickel 0.81
Chromium 0.17 0.18
Molybdenum 0.32
Length of Surface to Which Flames are Applied and No. of Flames

Fig. 20—Recommended acetylene pressure when hardening two flat areas perpendicular to each other

Fig. 21 — Extracting heat from hardened surface by cooling body of casting

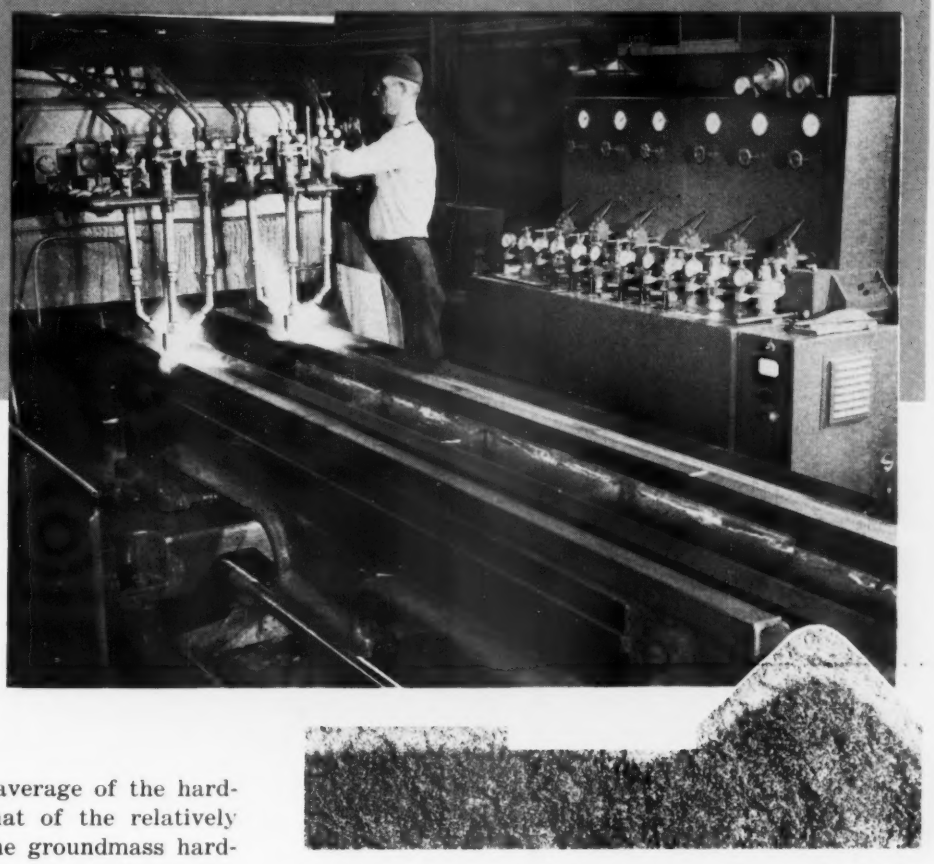


Fig. 22 — Progressive flame hardening of lathe bedways. Cross section of the hardened layer of the bedways shown in Fig. 23 at right

ness figure for gray iron is an average of the hardness of the groundmass and that of the relatively soft graphite flakes. Actually, the groundmass hardness on which wear resistance is dependent approximates 600 brinell. With the addition of 2.5 per cent Ni and 0.5 per cent Cr, an average surface hardness of 550 brinell can be obtained. The same result has been found possible using 1.0-1.5 per cent Ni and 2.25 per cent Mo.[11] Small chromium additions are particularly valuable in preventing softening and insuring retention of a high combined carbon content during heating to the hardening temperature.

The most common alloy additions to gray iron for flame hardening are nickel, chromium, molybdenum, vanadium and manganese. All of these alloy additions generally improve the hardness, wear resistance and strength of flame-hardened gray iron.[12]

Table I gives the composition of a group of alloy gray iron cylinders (Fig. 1) 1⅛ x 4 in. which were hardened by spinning at 400 rpm under an oxyacetylene flame, followed by water quenching. The total period of the hardening cycle was 40 seconds. Table II shows the Rockwell C hardness of the hardened cylinders at various depths below the surface. Not only did the alloys present increased surface hardness of the casting after heat treatment, but in the case of the chromium-nickel-molybenum iron, the depth of the hardened zone was somewhat increased.[13]

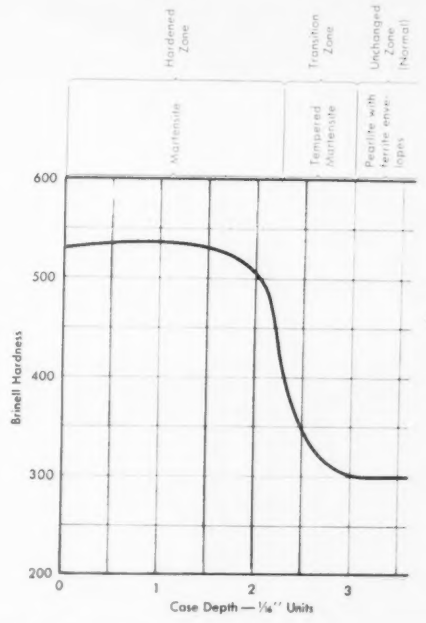


Fig. 24—Decrease of hardness with increasing depth of case for typical flame-hardened iron

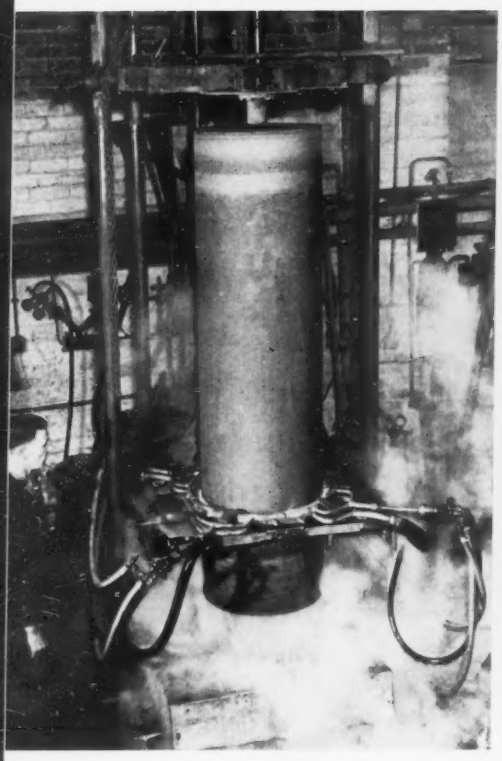


Fig. 25—Gray iron roller shell 78 in. long being hardened by the rotary progressive method. Shell is rotated and the flames travel from end to end

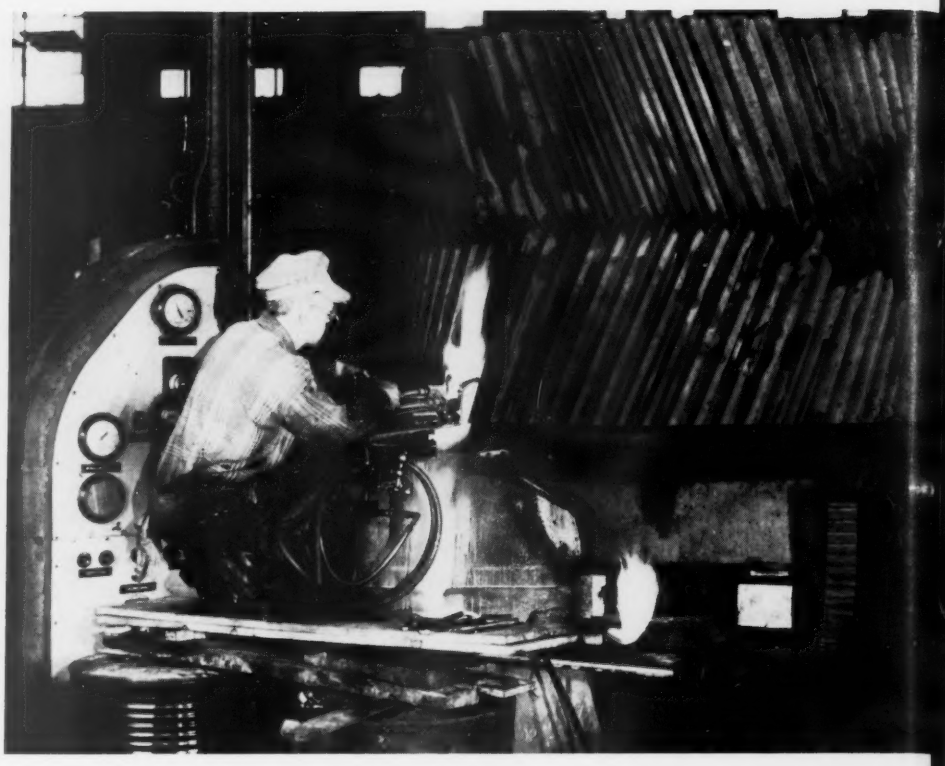


Fig. 26—Hardening teeth of a large gear by hand

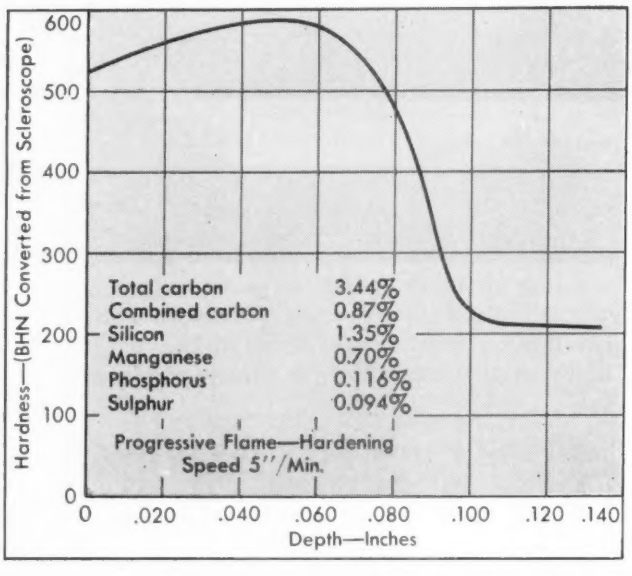


Fig. 27—Showing hardness at various points below the surface of a flame-hardened gray iron

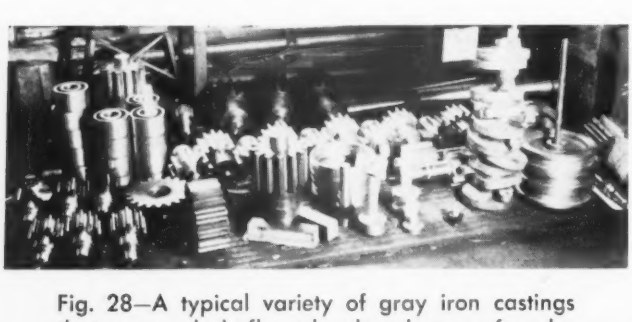


Fig. 28—A typical variety of gray iron castings that are regularly flame hardened at one foundry

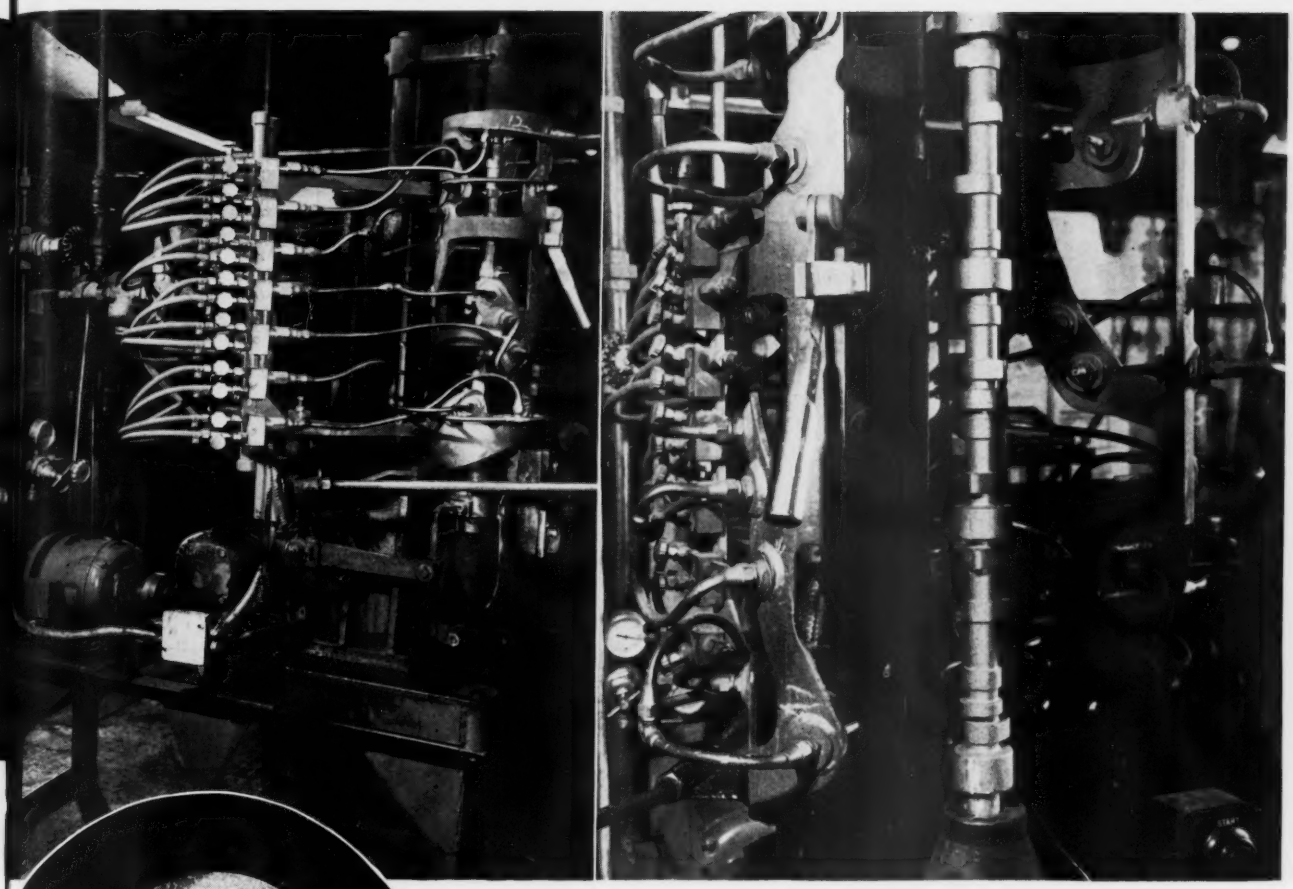
Typical alloy gray irons for machine tools to be flame hardened may contain:

	I	or	II
TC	2.80-3.20%		2.80-3.40%
CC	0.6%-min		.....
Si	1.70-2.00%		1.50-1.80%
Mn	0.70-1.00%		0.75-1.10%
Ni	1.00-1.50%		.....
Cr or Mo	0.25%		0.20%
P	0.15% max		0.15% max
S	0.10% max		0.10% max

These irons have a fine pearlitic matrix and can be hardened easily.[14] A relatively high steel percentage in the cupola charge is recommended in the case of analysis II.

Design for Flame Hardening—The general rules in designing all castings apply also to castings to be flame hardened. Extra foundry stock, particularly on light sections, should be provided to allow for possible warpage and clean-up. Holes in the castings preferably should be countersunk and whenever possible, should be located so that the outside of the hole is at least ¼-in. from the edge of the casting. Sudden changes from light to heavy sections in the flame-hardened area should be avoided, and sharp corners should be eliminated by use of generous fillets.[15]

If possible, the flame-hardened area should be so designed that it may be heated uniformly; otherwise, there will be variation in the depth of the hardened layer. Massive parts near a thin section to be flame hardened can absorb a large portion of the heat and may cause nonuniformity in layer depth. Re-entrant angles cause heat to dissipate rapidly, and salient angles act as heat-concentrating spots. In both cases



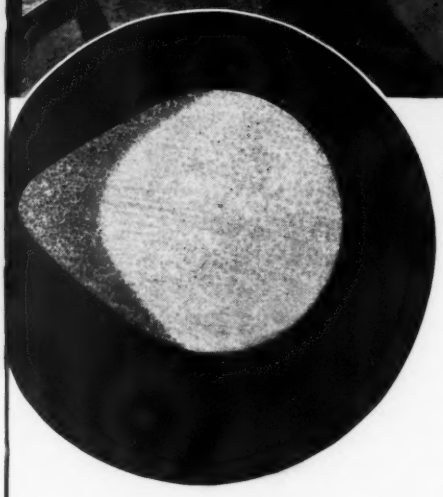


Fig. 29 (upper left)—General view of gas-flame heating machine with automatic timing arrangement for hardening parts of camshafts. Close-up view of machine with camshaft in place is shown in Fig. 30 (right). Cross-section of the flame-hardened gray iron camshaft is shown in Fig. 31 at left

the uniformity of the hardened layer may be affected.[11,16]

Types of Flame Hardening — Flame hardening methods applied to gray iron have been divided into four classes, depending on the relative positions of the casting and the heating torch or torches.[3]

Stationary Hardening: In this case neither the casting nor the torch moves during heat treatment. The hardening effect is limited to the area under the torch. This process has limited application.

Progressive Hardening: In this method either the work moves relative to the torch or the torch moves relative to the work (Fig. 2). Usually the heated area is progressively quenched by a water spray which follows the movement of the torch.

Spinning: The work spins under a stationary flame (Fig. 3). The work is usually rotated in the flame until the entire periphery has reached the necessary temperature, at which point the flame is shut off and a quench applied.

Progressive Spinning: This is a combination of the progressive hardening and the spinning methods, usually applied to long cylindrical castings (Fig. 4). Frequently, the casting is rotating between the centers of a lathe, while the torch or torches on the lathe carriage progressively move along the casting.

Flame Hardening Equipment—Although it is impossible to describe here each of the numerous flame-hardening machines available for use on gray iron, some attempt will be made to give a few typical examples.

The simplest type is a welding torch mounted on the carriage of a lathe or an oxyacetylene cutting machine.[3] Such a set-up has been used successfully for the very simplest type of flame hardening. For more complicated operations, special flame-hardening torches may be purchased.

Typical oxyacetylene torches suitable for the flame hardening of gray iron are shown in Figs. 5 and 6. When large areas are to be hardened, water-cooled tips give the best results. Typical large-capacity flame hardening tips are shown in Fig. 7. Fig. 8 demonstrates a method of hardening a large, flat area using multiple torches, with several torches manifolded on one tip. A special tip for the hardening of internal rounds is shown in Fig. 12.

The use of flame hardening machines is recommended where high pro- (*Please turn to page* 188)

Cold Cracks in White Iron

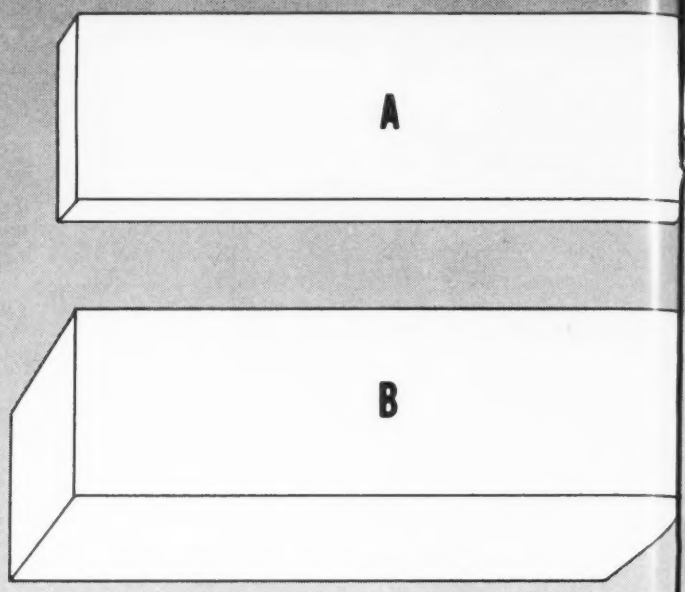


Fig. 1—If two bars of equal length and height but of different thickness are heated, then cooled, the lighter one will reach room temperature size first

In discussing the causes of cold cracking and hot tearing in the production of malleable castings, the author segregates the two and tells how to reduce cold cracking

IN THE manufacture of castings from a brittle material, particularly white iron, trouble often is encountered from cracks, resulting from residual stresses which develop as the casting cools from solidification to room temperature. Such ruptures often are referred to as strain cracks or cold cracks. They are differentiated from hot tears by the fact that they occur at or near room temperature and the fracture surfaces are oxidized only slightly, if at all.

While residual stresses are probably present to some degree in all castings, the problem of the malleable foundryman is somewhat different from that of those foundries producing other metals which may develop appreciable residual stresses. In the malleablizing anneal, with its transformation of white iron to ductile malleable iron, any stresses present are removed; thus the malleable foundryman is not concerned with the problems which arise from failures in service because of residual stresses. His problem, then, is in handling the casting in process before the anneal.

Cooling Stresses Generated—Because of the characteristic lack of ductility in white iron and its high linear contraction, cooling stresses of great magnitude are generated. While these stresses may not be great enough to cause rupture in a quiescent casting, a failure may be induced by a mechanical shock—as in spruing—or a thermal shock, as when placed in a hot annealing furnace. This tendency increases with the magnitude of stress. Thus, the problem in the malleable foundry is to produce castings in white iron, not necessarily free of stress, but sufficiently low in residual stresses that they will withstand normal handling.

It is the purpose of this discussion to offer a simplified outline of the mechanism which produces residual stresses, and from that to develop some means by which these stresses may be controlled.

It first is necessary to consider the physical characteristics of white iron which make it susceptible to the generation of high cooling stresses. The linear contraction of white iron in the temperature range from 2102° F to room temperature is quite high compared with metals which do not cold crack. It has been found that this shrinkage in white iron is about 2.0 per cent as compared to 0.67 per cent for a highly ferritic gray iron. Thus, the force imposed by the contraction of one member of a casting upon another cooling at a slower rate is very great.

Not Relieved by Deformation—At room temperature white iron has no appreciable ductility, and, since it is so rigid, any stress which may have developed in cooling cannot be relieved by deformation of a casting as might be the case in a low-carbon steel. However, these irons do have very appreciable ductility at high temperatures, on the order of 1600° F, which decreases to none as the temperature drops to 1100° F. A combination of these characteristics and uneven cooling throughout the casting from solidification are the factors which result in development of residual stresses and subsequent cold cracks.

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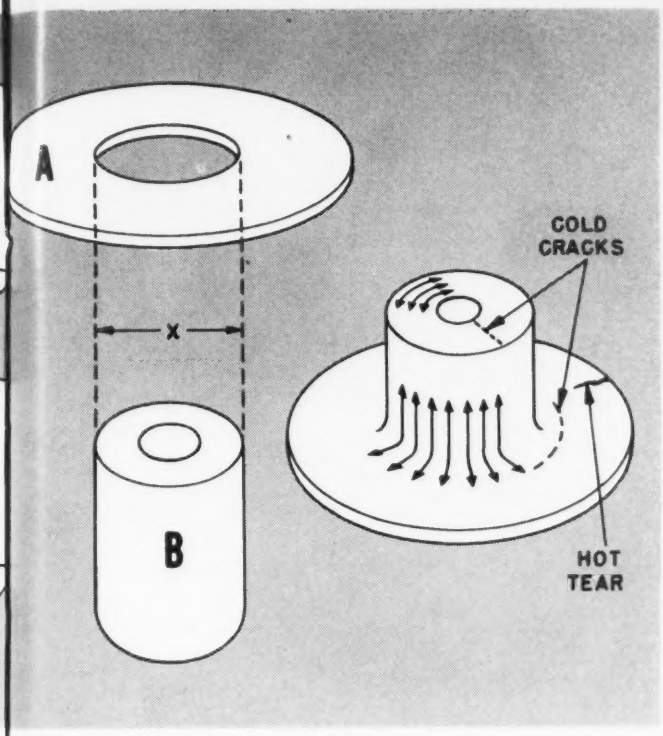


Fig. 2—Cylinders A and B have common dimension, X. However, on cooling, A will cool faster than B because of its smaller ratio of mass to surface area

Fig. 3—The cylinders are joined at point of common dimension to form a flanged hub casting. Stresses built up during cooling will result in cold cracks

To study the mechanism of the generation of residual stresses in white iron two simple bars as shown in Fig. 1 may be considered. These bars are of equal length and height but of differing thicknesses. Bar A has a much smaller mass-to-area relationship than bar B and for this reason will dissipate heat more rapidly. If these two bars are placed in a furnace and heated to about 2000° F and then withdrawn and allowed to cool in air it is easily realized that bar A will reach its normal room temperature dimension more quickly than bar B because of its more rapid cooling.

Another example can be shown by the two cylinders in Fig. 2. These cylinders have a common dimension "X" as shown. Here again cylinder A has a smaller ratio of mass to surface area than cylinder B and therefore will cool faster. Thus, we can expect to find "X" of cylinder A to contract to its room temperature dimension sooner than "X" of cylinder B.

Now we shall consider Fig. 3 where the two simple cylinders have been joined at the point of common dimension to form a simple flanged hub, a design which when cast in white iron is susceptible to cold cracks. If this hub is heated to 2000° F and allowed to cool in air to room temperature, the flange will cool, and thus contract, more rapidly than the hub. If the cooling rates are such that the flange reaches 1100°F sooner than the hub, the contraction in dimension "X" will be affected to some extent since the force set up by the contracting flange will dissipate itself in the deformation of the hub which is ductile above 1200° F and, therefore, capable of being plastically deformed.

Dimensionally Unstable—It is at this point that the casting becomes dimensionally unstable. While the outside diameter of the hub at the juncture with the flange has been forced mechanically to approximate its normal room-temperature dimension, thermal contraction has not been consummated. Thus, additional contraction of the hub must continue to room temperature. The forces set up in this further contraction of the hub cannot dissipate themselves in plastic deformation of the flange because at 1100° F the flange is no longer ductile, or capable of being plastically deformed. Since the forces set up by the contraction of the hub as cooling takes place cannot be denied, elastic strains are set up, as in a loaded spring, which can be released only by failure of the casting or some type of permanent deformation to restore dimensional stability. These strains are relieved only slightly upon further cooling to room temperature and the result is residual stresses remaining in the casting to cause what we term cold cracks or strain cracks.

Smaller strains will result in weakening the casting to the extent that it will not withstand shocks of normal handling. In Fig. 3 these stresses are indicated by the arrows to be tensile stresses in the sections of the casting last to cool. Thus, we will expect cracking to occur radially through the hub or circumferentially in the flange as shown by the dotted lines.

Cool in the Mold—The foregoing discussion has been based on air cooling of the casting to eliminate other considerations. Certainly, cooling in the mold after casting would affect cooling in a favorable manner as regards stress production, however, it is fundamentally desirable to gate and feed castings into their heavier sections which would unfavorably affect the cooling.

Another factor which may be considered here is that of hot tearing. If the resistance by the hub to deformation is greater than the force of contraction which the ultimate strength at high temperature of the metal in the flange will permit it to exert, a hot tear conceivably could occur radially from the outer circumference toward the hub. In such a case, the contraction force is dissipated in the hot tearing. This situation is worsened by a hub core which does not collapse sufficiently soon enough, although instances are known where the type of core used appeared to have no effect on hot tears of this type. It is probably for this reason that a hot tear and a cold crack seldom are found on the same casting. This type of hot tear is illustrated on Fig. 3 by the jagged line.

In this mechanism by which cold cracking is brought about, the remedy which suggests itself is that if it were possible to cause (*Please turn to page* 266)

Fig. 1—This general view shows green sand molding in AiResearch's aluminum foundry

Foundry Specializes in

CLOSE-TOLERANCE CASTINGS

By FRANK WARGA

General Foreman, Ferrous and Nonferrous Foundries
AiResearch Mfg. Co., Los Angeles

PRECISION casting technique plays an important role in the operation of the aluminum and ferrous foundries of the AiResearch Mfg. Co., a division of the Garrett Corp., Los Angeles. The company manufactures nearly a thousand different products in the fields of temperature controls, electronic controls, electrical actuators, cabin superchargers, air conditioning, gas turbines, pneumatic units and heat transfer equipment. Cast parts play an important role in each of these categories.

AiResearch opened its aluminum foundry in 1946. Castings are made in green and dry sand molds, including shell molds, and in centrifugal casting machines. About 75 per cent of all the aluminum castings are made in green sand molds.

Sand preparation equipment is located on a mezzanine floor. A synthetic fine-grain sand mixture is prepared in a 500-lb capacity muller and transferred by cart to hoppers serving the machine, bench and floor molders on the main floor.

Aluminum alloy is melted in cast iron pots which are cleaned and then coated with a wash after each 8-hour shift. While pouring the metal, the ladles are held close to the sprue to insure minimum agitation. Success of the precision castings is attributed to close sand control, care in melting, and the gating system, a 4-2-1 ratio for risers, runners and sprue. Usual sprue size is ½-in. diameter, occasionally ⅝-in.

Sand for dry sand cores is a 100 mesh white silica sand from Nevada. A urea-formaldehyde base binder produces cores that show good collapsibility at the shakeout.

Fig. 2—Molds in the centrifugal casting section produce aluminum castings varying from 1½ to 9 lb

Fig. 3—Aluminum foundry sand is moved by cart from the 500-lb capacity muller to the hoppers

Fig. 4—General Foreman Frank Warga discusses a ferrous casting problem with a member of his staff

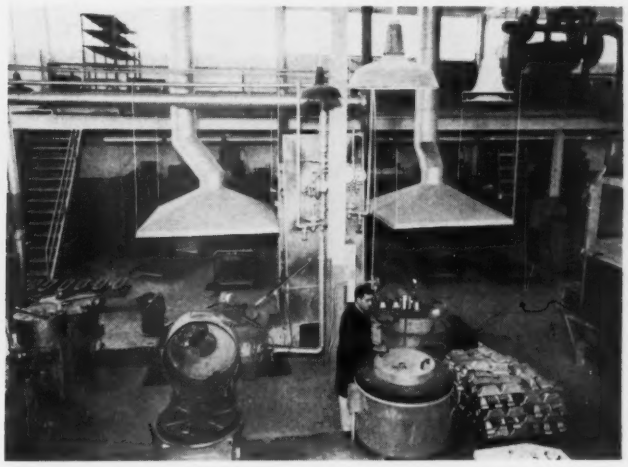


Fig. 5—Aluminum foundry melting equipment is operated in conformity with local smog control laws

For shell molds the patterns are heated from 400 to 600° F. Sand is left on the pattern from 3 to 10 seconds. Curing is effected in 30 seconds at 450° F. The shell mold wall is ⅜-in. thick and the halves are glued together. Casting dimensions are held to a tolerance of 0.005-in.

In the centrifugal casting department 25 active molds produce castings varying in weight from ½ to 9 lb. Steel molds and plaster cores are mounted on two rotary type machines, one with a table 24 in. in diam, and the other with a 36-in.-diam table. Molds and cores are preheated to a temperature of 800° F. The molten aluminum is poured through a sprue in the center and can swirl either right or left depending on the design of the casting. Speeds varying from 200 to 500 rpm are controlled by a tachometer speed control unit mounted behind a transparent panel. Speed depends on the grain pattern desired in the casting. Machine continues spinning until the sprue has set. The sprue also serves as a riser or feeder.

The centrifugal process produces castings with superior strength and hardness. Poured at lower temperature than into sand molds, the metal receives a quick chill with resultant fine grain structure. Tolerances are held to 0.002-in. A typical example is the turbine impeller used on gas turbine compressors. These thin blade impellers operate at a speed of 44,000 rpm and are over-all speed tested at 48,000 rpm.

Ferrous Foundry—A second foundry of AiReseach began producing ferrous castings Dec. 16, 1952. Our belief that experience in casting nonferrous alloys would be of great practical value in casting ferrous metals proved to be slightly optimistic. However, with the proverbial luck of the tyro, unaware of what could not be done, the crew went blindly ahead and did the impossible.

In a plant floor space 60 x 120 ft, 16 workers in a period of 11 months produced 33,000 acceptable castings from a total melted tonnage of 155,093 lb. While these figures do not represent what should—and will

Fig. 6—Sand used for dry sand cores in aluminum foundry coreroom, which is shown here, is a 100-mesh white silica variety from Nevada

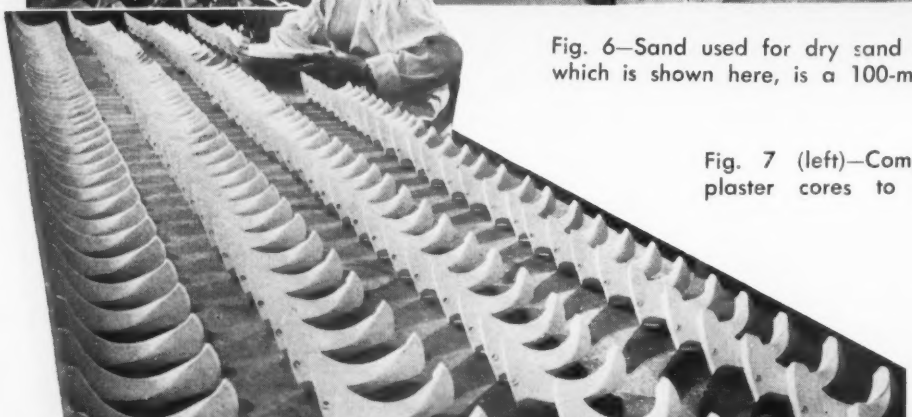


Fig. 7 (left)—Company's aluminum foundry uses plaster cores to make its centrifugal castings

Fig. 8 (below)—Oven used to bake both cores and molds in the new ferrous foundry

Fig. 9—One of two induction furnaces used to melt stainless steel

Fig. 10—Most of the molds used to cast ferrous metals are made by hand, like those which are shown in this illustration

—be done, they do indicate pleasingly profitable operation. Great bulk of the work involves small, thin-wall castings ranging in weight from 2 oz to 7 lb. They include Armco 17-4 (precipitation hardening), Ni-Resist types 1 and 2, and practically all stainless steels.

Our ultimate objective is to produce all components so accurately in the as-cast condition that they will require no machining prior to entering various assemblies. This goal never may be attained, but efforts to date have produced as-cast components dimensionally accurate within 0.10-in. tolerances and consistently capable of meeting government specifications for x-ray testing.

Melting equipment is operated in conformity with local smog control ordinance, especially strict in the Los Angeles area. Armco and stainless steel alloys are melted in two 150-lb capacity induction type electric furnaces. Pouring temperature is approximately 3000° F. Ni-Resist alloys, poured at about 2850° F, are melted in a 450-lb rocking arc furnace. No smoke precipitation or filter equipment has been required to prevent atmospheric pollution.

Although a new pattern shop is operated in connection with the ferrous foundry, it has been found that the same types of wood and metal patterns used in the aluminum foundry may be used in the ferrous foundry. Frequently the work load in the two pattern shops is balanced. Masters for aluminum are made by ferrous patternmakers, and vice versa.

Cores are made of extra fine sand bonded with oil type binders. A current series of experiments may result in the use of a synthetic binder. Cores as well as molds are baked in a 6000-lb capacity rack type oven and handled by a lift truck.

Consideration has been given to the use of the investment molding process for some of the ferrous castings. Close study seemed to indicate that any advantages gained in quality would be exceeded by higher production costs. Castings are made either in shell molds or in dry sand molds. Some molds are made on a small rollover machine, but the great majority are made by hand. The management has decided that the cost of shell molds made with phenolic resins is justified only by improvement in the quality of stainless steel castings. Hope also is expressed that future improvements economically can be attained through the eventual use of ceramic molds.

Complete sand control laboratory facilities eliminated most of the mold making difficulties encountered during the initial weeks of ferrous foundry operation.

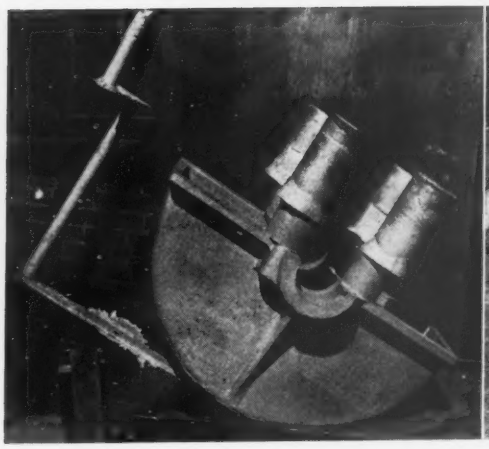
Ample facilities are provided for grinding, and pressure cleaning the castings either with sand or with metal abrasive. Castings are annealed before they leave the ferrous foundry.

Annealed castings are shipped to a subcontractor's laboratory for x-ray inspection. Castings that pass the test are sent to the company's main plant where they are machined, plated or coated as required, and assembled.

The gating problem was one of the most serious encountered in transferring from nonferrous to ferrous foundry practice. Experience has shown there is no universal, cut-and-dried rule that applies. Apparently the only satisfactory way to gate a mold for a ferrous casting is to exercise a liberal amount of common sense.

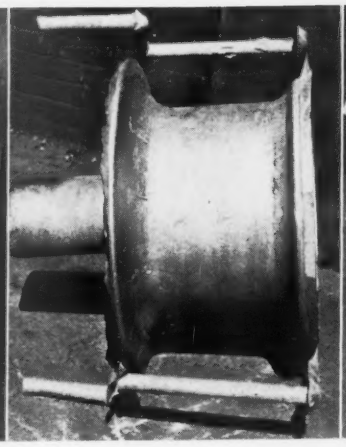
Most of the metallurgical headaches are avoided by purchasing pre-alloyed metal, and by making constant use of a rapid carbon determinator. On small-scale production and experimental operations we find it practical and economical to prepare our own alloys.

Barring an unpredictable calamity the ferrous foundry should be operating at the peak of its productive capacity by the end of 1954.



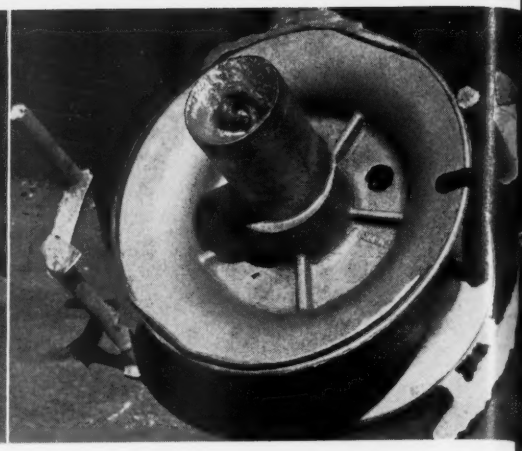
1

Fig. 1—This gear casing is produced without difficulty with standard method of gating shown. Down



2

sprue is 1¼ in. diam. Fig. 2—Idler pulley is 14 in. high, 21 in. OD, with 14-in. drum. Castings poured



3

Manganese Bronze Gating Problems

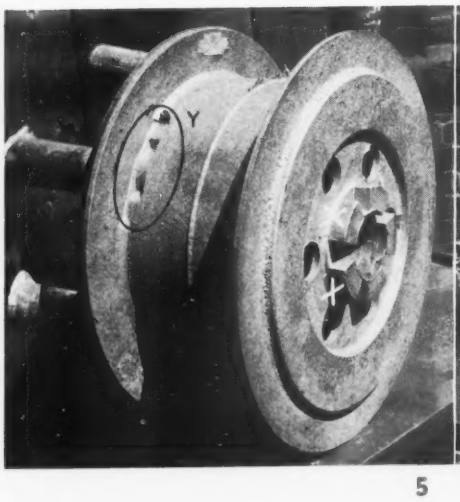


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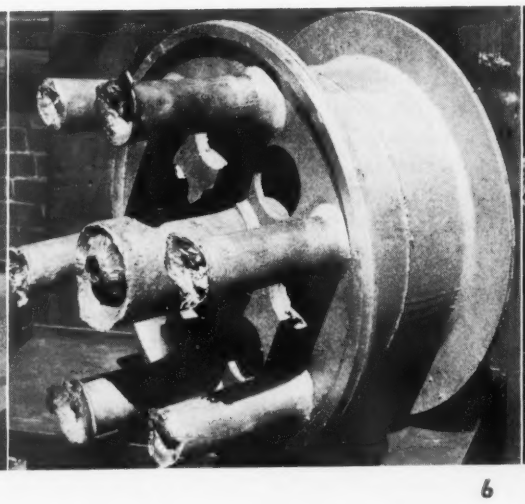
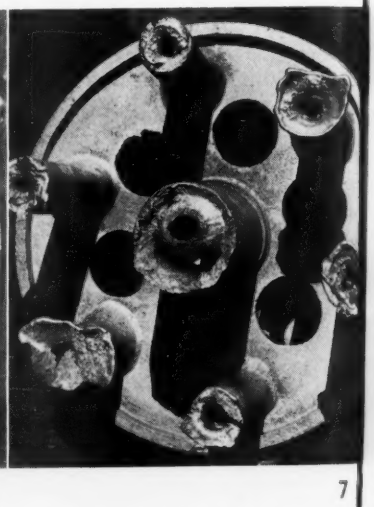
Fig. 5—Driving drum poured through two oval gates. Five chills applied



6

on lugs (X). Recessions in area Y are rope anchorages. Figs. 6 and 7



7

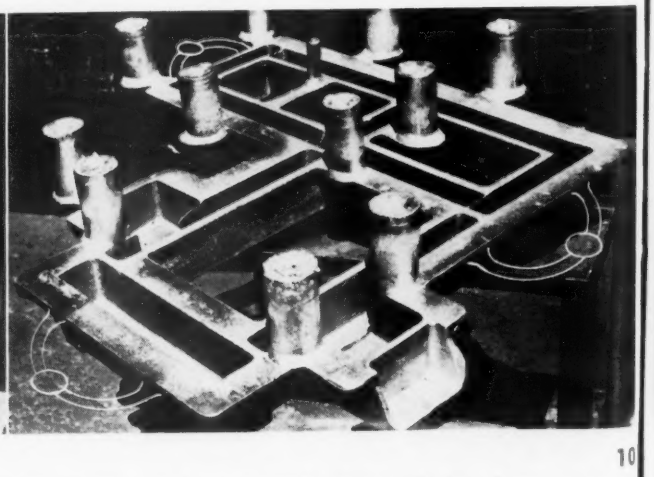
show location of 3-in.-diam risers, which are placed over internal ribs

8

Figs. 8 and 9—Two views of clutch poured through three ⅜-in. pencil gates connecting with a 1-in. down-

9

gate running into a ring gate, and entering mold through five lugs. Fig. 10—Base frame casting poured



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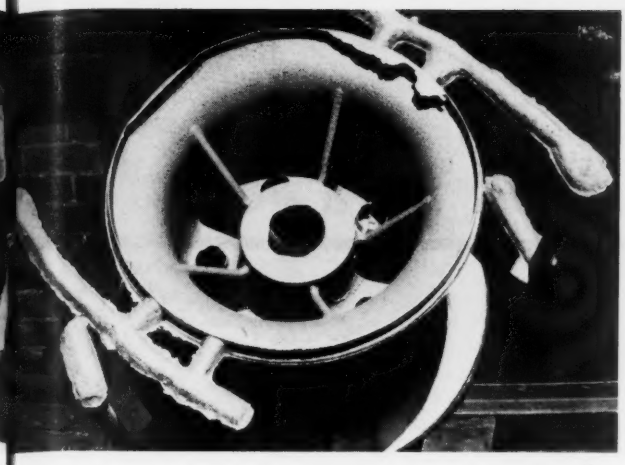
through three 1¼-in. down-gates at locations sketched in illustration. Eleven 3 x 6-in. risers feed casting



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two up with two 1¼-in. sprues. Fig. 3 shows 5½-in.-diam riser, 7 in. high. Drag side shown in Fig. 4

AT THE Davis & Furber Machine Co., North Andover, Mass., the men on the floor know all about the rules for making castings. But they have experience, too, which tells them when the rules need readjustment.

Rules are something the jobbing foundry needs to break more often than the production shop because the patterns come in less frequently and don't stay very long. Manganese bronze molding practice follows fairly well known rules. Because it is a dross former and a heavy shrinker, castings of manganese bronze should be (1) bottom gated; (2) a runner extension usually added; (3) the metal filtered through skim gates or dams to eliminate dross; and (4) the molds gently filled to avoid folds or scabbing.

Large risers, to provide ample feed, are necessary to compensate for the heavy shrinkage as well as for the faster freezing of the bottom-poured, cooled-down metal in the riser. A casting yield of 40 per cent for manganese bronze might be considered normal as compared to 60 per cent for a tin bronze. Fig. 1 illustrates the typical and successful gating procedure for a manganese bronze casting. The metal was poured at 1950-2000° F. Its composition was:

Cu	Zn	Fe	Al	Mn	Min. Ten. Str.	Min. Elong.
58	40	1.10	.65	.25	65,000 psi	20%

The gear casing (Fig. 1) poured with a 1¼-in.-diam down sprue, bottom gated and risered with four risers each 4 in. in diameter by 8 in. high, came through with an average yield of 45 per cent. Out of 250 lb of liquid metal, a 115-lb casting could be shipped. Casting sections were ¾-in. thick in the body, and up to 2 in. thick at the bearings. Its production conforms to the general rules.

Castings for which the manganese bronze gating rules had to be modified occurred in the form of two cable drums. One of these was an idler, while the other was driven by a clutch through an integral boss on the hub. While both looked alike, the actual difference was enough to require a change in procedure.

Figs. 2, 3 and 4 illustrate the usual bottom gating designed for a smooth, quiet flow of metal into the mold. The gating system, with runner extensions, traps the dross and dirt. Two orifice openings to the casting that have twice the capacity of the runner assure the metal cavity of being filled with clean, nonturbulent metal. The casting sections vary from ¾-in. thickness in the flanges, to 1¼ in. thickness at the hub. The casting is 14 in. high and 21 in. OD over flange edges and 14 in. in diameter in the drum or cylindrical section. The drum was made in dry sand and cores. The 120 lb of liquid metal needed to pour the mold resulted in a finished weight of 72 lb for the casting, or a yield of 58 per cent.

The driving drum casting (Figs. 5, 6 and 7) was initially gated in a system similar to the idler-pulley, but internal shrinks developed at the projections on the hub, corresponding to the clutch area. Chills were applied to correct this. Additional shrinks occurred in the cope side at the three-way junction of the flange, side wall and internal rib. Chills, when applied to these underfed areas, failed to eliminate the six cope-side shrinks.

A decision was made to top pour and to put chills on the lugs in the drag, thus making the molding easier and saving molding time. With cores occupying the cylindrical interior of the casting, it would be safe to pour into the cores and depend upon an ample riser system to float off the scum and feed the T-shaped cross sections representing the junction of cylinder and flange. A runner box was placed across the cope and two elliptical gates, ⅝ x 1 in., placed over the riser on the hub. The metal was then poured into the riser and down the hub.

Risering Was Augmented

In addition to the large 5½-in.-diam by 8-in.-high hub riser, the risering was augmented by a 3-in.-diam by 8-in.-high riser over each of the six ribs. Successful castings resulted. Out of 450 lb of liquid metal poured, a casting of 260 lb resulted, for a 58 per cent yield. Higgins* had shown that 3-in.-diam by 18-in.-long sticks, when bottom poured in the conventional manganese bronze manner, possessed a thicker top side skull and internal shrinks for 9 in. of its 18-in. length. The same casting poured fast and from the cope side, finished with an open top shrink 3½-in. deep and sound metal over the remaining 14½ in. of its length.

A manganese bronze cylindrical clutch casting, bottom gated in the conventional way (Figs. 8 and 9) delivered sound castings with a yield of 50 per cent. It is 8 in. ID by 16 in. long and 2½ in. thick.

Fig. 10 presents a study entitled "where are the risers needed?". By a process of evolution, the locations were determined and thereafter the production of sound castings was established. The casting was poured with three ladles up. Each ladle poured into a 1¼-in.-diam sprue which entered the bottom of the casting at the points indicated.

Conventional procedures for the gating of castings provide the foundryman with the basic rules for success. Castings which defy the rules provide a challenge to the foundryman to use unconventional methods for their production and consumer acceptance.

*Higgins, A. K., "Nonferrous Applications of Top Pouring Methods," AFS *Transactions*, Vol. 48, 1940, pp. 518-530.

QUESTIONS

Chilled Areas Cause Trouble

QUESTION We are producing gray iron from charges composed of 25 per cent returns and 75 per cent purchased scrap iron. Charges are 1000 lb and to each we add 1½ lb silicon, 1½ lb ferromanganese, two silicon carbide briquets, and 1 block of fused soda ash. Latest analysis shows the iron composition as 2.16 per cent Si, 0.44 per cent Mn, 0.524 per cent P, 0.138 per cent S, 2.48 per cent GC and 0.79 per cent CC, and that is about the way it usually runs. What is the best way to reduce the CC and S? We are enclosing two specimens which show the trouble we encounter about once every two weeks which causes considerable scrap in our light castings. Can you tell us the cause and remedy? As you can see, the farther from the gate, and the thinner the section, the more the white fracture shows up.

ANSWER Examination of the two specimens indicates the possibility of two causes, or perhaps a combination, which result in the appearance of the white fracture or chilled portions of these light-section gray iron castings.

First is that the silicon content is low for thin-section work since usual practice for stoveplate or similar castings is to have the silicon around 2.50 per cent. The other cause is the presence of gas in the iron, indicated by the holes in the smaller of the two specimens which, while about ¼-in. thick, shows a complete white fracture. The larger of the two, in addition to showing white fracture in the thinner portion, also shows the presence of "inverted" chill—that is, a thin gray skin on top and bottom with the white fracture material between the two.

Some time ago Zapffe suggested that presence of hydrogen in gray iron was the cause of inverted chill, and possibly as earlier mentioned, the combination of low silicon and gassy metal may account for your difficulty. This is from the viewpoint that the trouble does not occur regularly. We suspect that the presence of

Left shows inverse chill; on the right, full chill and gas holes

gas results from use of damp spouts and ladles; also that the silicon content when you run into difficulty may be much lower than indicated by the analysis.

You do not mention why you hold the silicon content around the value given, but presumably other castings you make are of heavier section, and the composition is a compromise which ordinarily serves satisfactorily for both types. One method to eliminate the trouble without changing the analysis would be to pour wedge bars and correlate the length of chill in the bars with the occurrence of white fracture in the thin-section castings. With that information, only those ladles showing the minimum chill in the wedge bars would be poured into the thin castings. The other procedure would be to add sufficient ferrosilicon or other graphitizing agent to each ladle of iron poured into such work. Amount to be added will depend upon the agent used, and will have to be determined by experiment.

Sulphur content of the iron can be reduced by use of soda ash in a mixing or receiving ladle located at the cupola spout. Possibly you can secure some reduction by increasing the amount of soda ash in the cupola up to 8 lb per ton, or double your present addition. Amount of combined carbon can be reduced by increasing the silicon content or reducing the cooling rate of the casting.

Cupola Banked if Necessary

QUESTION The practice of banking blast furnaces over long periods seems to be quite satisfactory. Has any person ever tried banking a cupola, and if so, with what success?

ANSWER Theoretically, it is just as easy to bank a cupola as it is to bank a blast furnace. However, in actual practice the operating conditions are widely different. Economic conditions that suggest the advisability of banking a blast furnace are not present in a foundry, hence there is nothing to be gained by voluntarily banking the cupola.

Occasional instances arise where the operation of the cupola has to be suspended for some time. Probably, by stretching the actual meaning of the term, one of these periods might be termed a banking period and may extend from 1 to 12 hours. Possibly also the period of rest might be extended beyond 12 hours, but we have no record of any cupola being held for any longer period. On several occasions FOUNDRY has presented descriptions of instances when cupolas were banked for varying periods of time up to and including 12 hours.

In foundries where cupolas are operated continuously the usual

ANSWERS

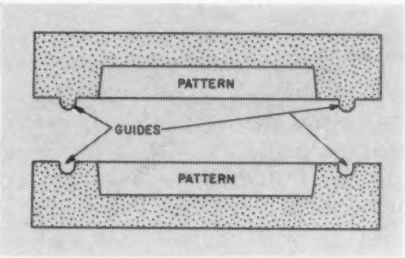
practice is to shut off the wind for an hour at the lunch time. Occasionally in the average foundry where the regular heat may run from 1 to 4 hours, an involuntary shutdown may be caused by any one of many reasons, usually a breakdown in the blowing equipment or in the power supply. This should cause no alarm. Since melting continues for a short period after the blast ceases, the tap hole is opened and the cupola is allowed to drain until melting ceases. All air inlets then are closed. A piece of stock core 8 to 10 in. in length is inserted in the tap hole. The gate in the blast pipe is closed. If there is no gate, the air inlet to the blower or fan is stuffed with water-soaked old bags. Tuyeres are stuffed with old bags backed with a few shovels of sand.

How Plaster Molds Are Made

QUESTION We have been experimenting with making plaster molds without too much success, and would like some details on the practice so that we could do it properly. What is used to prevent plaster sticking to the pattern?

ANSWER Method of preparing plaster molds does not differ to any marked extent from that employed in making a mold in sand. Pattern and parting surface between cope and drag are coated with a release agent to prevent sticking. A wide variety of materials, including proprietary types, are used. For example, the following mixtures have been suggested: Stearic acid ¼-lb and kerosene 1 pt; petroleum jelly diluted with 2 parts kerosene; lard oil; 25 per cent light lubricating oil, 75 per cent kerosene, 1 per cent wetting agent; potash soap solution; wax-oil, and wax-water emulsions. Only a thin coating is required, and care must be taken to see that the material does not collect in pockets and corners.

For purpose of illustration it is assumed that a solid pattern is to be molded partly in the drag and partly in the cope. The cope part of a small metal or wood flask is set on a board, joint side up, rammed full of sand and struck off.



Male and female guides formed in joint faces between molds

A hollow is scraped in the sand and the pattern bedded down to the half-way line. A parting is made and the exposed part of the pattern is coated with the release agent. The drag part of the flask (well-coated with the release material) is adjusted in place and filled with the casting plaster mix prepared according to the manufacturer's directions.

Plaster is allowed to "air set" and then the entire flask is rolled over. Cope is removed and shaken out. Exposed joint face is scraped and cleaned. A thin coating of the release agent is applied to the parting surface and the exposed part of the pattern.

In some instances a shorter alternative method is employed. The drag flask is filled or nearly filled with plaster. Then the pattern is pressed down half-way or to the approximate parting line. In either instance two or more small indentations are scooped in the parting surface to serve as locating points for the upper part of the mold when the flask is removed. Brass pins or other devices may also be used. Usual shape of the guide feature is shown in the accompanying sketch.

The coated cope is replaced, coated gates and gate sticks set in place, and the cope is filled with liquid plaster as in the first instance. When the plaster has set, the cope is removed from the drag and the pattern taken out of the drag. If wood flasks are employed, they are removed, and both parts of the mold are placed in an oven and dried thoroughly for 10 to 14 hr at 400 to 600° F. Molds while still hot are taken from the oven, carefully clamped together and filled immediately with molten aluminum, brass or bronze as the case may be. It might be pointed out that, due to the insulating properties of plaster, the gating system does not have to be as large as for sand molds.

Heat Transfer Rate Is High

QUESTION What effect do infrared rays have on aluminum in respect to heat treatment? We have an infrared lamp oven in which our nameplates are heat treated in 15 minutes as compared to several hours with conventional methods.

ANSWER Difference between infrared and conventional oven or furnace heating lies in the method of heat transfer. In the oven, heat is transferred from one body to another by convection or employment of a liquid or gaseous medium. In infrared heating the transfer is by radiation directly to the body to be heated.

In convection oven practice, heat transfer is directly proportional to the temperature difference between the body being heated and the surrounding air. Movement of the air helps eliminate the insulating influence of gaseous films adjacent to

the work, and directly increases heat transfer. Hence, the use of forced circulation in preference to gravitational circulation in ovens not only provides uniform temperature in all areas, but increases rate of heat transfer.

While air temperature is not important in original heat transfer in infrared heating, it is important with reference to heat losses. Losses depend on the temperature differential between surrounding air and the heated surface. Consequently, maximum utilization of radiant energy is attained when the air temperature approaches the intended heating temperature, and for that reason radiant ovens usually are totally enclosed.

Has Trouble With Open Grain

QUESTION We make surface plates weighing from 500 to 6000 lb which must have a fine, close-grain finish after machining. However, on occasions we run into plates with what might be termed an open-grain appearance. Plates range from 36 to 48 in. wide, 40 to 144 in. long, and 4 to 6 in. high. Metal thickness ranges from 1⅛ to 1½ in. Drag and sides of the plates are made in slab cores, and the cope is formed in green sand with cores rammed in and wired to form the pockets in the plates. Castings are poured from a mix containing 50 per cent steel, 30 per cent pig iron (3.80 Si-0.65 Mn), 20 per cent regular machinery scrap and 2½ lb silvery pig. Enough charges to pour the plates are made up and go into the cupola first, followed by different mixes for other work. Castings are shaken out 5 to 6 hr after pouring, and they are red hot. Do you think such increased cooling affects the structure?

ANSWER While the castings are shaken out while they are red hot, we do not believe that such procedure will affect the microstructure. To obtain any structure change it is necessary to have the temperature at or above the critical or transformation temperature of the cast iron which varies somewhat according to the silicon and manganese contents.

In your case the calculations show a 1.54 per cent Si, and 0.52 per cent Mn content, indicating that the critical temperature is about 1400° F. Judgment of temperature by color is not very accurate, but in general it is assumed that a red heat is about 1000° F, and even if that is off as much as 100 to 200°, it still would be well below the critical temperature. If the shaking out at red heat had any effect, it would be to prevent graphitization or "open grain" structure.

Hence our opinion is that the "open-grain" appearance is caused by some change in composition, and that is borne out by your mention of spasmodic appearance. We suspect that this trouble is due to some mixing of the different charges employed for the variety of work, although it might result from errors in the make-up of the charges themselves.

Correction of the latter only requires a closer check on those responsible for making up the charges, but the former will necessitate a change in tapping practice to avoid any possibility of mixing of molten charges. We suggest that you place the requisite high-steel charges in the cupola as you now are doing, and on the last one put on a double split of coke. Then open up your taphole about 10 or 15 minutes after the wind is turned on, allowing the metal to run into the ladle. When all the high-steel charges have been melted a marked decrease in metal flow will occur due to the time required to burn up the excess coke placed between them and the following mixture.

Permanent Mold Coat Blisters

QUESTION Can you give us any information regarding a facing material which might be used in permanent mold casting? At the present time we use a carbon solution, but as the carbon builds up in the mold it blisters under heat with the result that the surface of the aluminum castings are pock marked. We believe there is a compound available which will do a better job.

ANSWER From your brief remarks on build up and blistering, it would appear that your trouble with mold coating is due to method of application rather than to the material itself. Usual procedure is initially to apply thin coats of the material until the desired thicknesses are established on various areas of the mold face to provide satisfactory cooling rates of different sections of the casting. After that the coating material is only applied at intervals depending upon the rate of wear on the coating. In some instances the recoating is done only once or twice a day while in others it may be done after each run of several castings. Possibly you are recoating too often and are building up a thick facing which tends to spall off.

In general, mold coatings are composed of a refractory suspended in water with or without addition of sodium silicate as well as such materials as graphite, rouge, etc. A number of proprietary compounds are on the market and may be obtained from the producers or from foundry supply houses. Our recommendation would be to obtain one of those rather than to try to develop one yourself.

Casting Aluminum Male Die

QUESTION Recently we received an order from a local machine shop for a male half of a die to be made of an aluminum alloy. Female portion is cast iron with a self-contained electrical heating unit. Assuming that we had a partial permanent mold, we placed a sheet metal cofferdam around the die to give a metal thickness of about 1 in. Then we turned on the heating element and used a torch to raise further the temperature of the die. Metal at about 1450° F was then poured in. On removing the casting we found a honeycombed surface. Die surface was smooth but dull, and metal was poured without turbulence.

ANSWER From the information given it is difficult to give a definite reason for the poor surface of the casting in question, but we suspect that the cast iron die against which the aluminum was poured was far from clean. Possibly oil or grease had been on the die surface, which is extremely difficult if not impossible to clean sufficiently that gases will not be generated when in contact with the molten metal. Oil and grease tend to remain in the fine pores.

Of course, it is possible that the cast iron die was not hot enough. Temperature should be between 600 and 800° F. Perhaps you may be having some turbulence even though you think otherwise, or are entraining air in the metal

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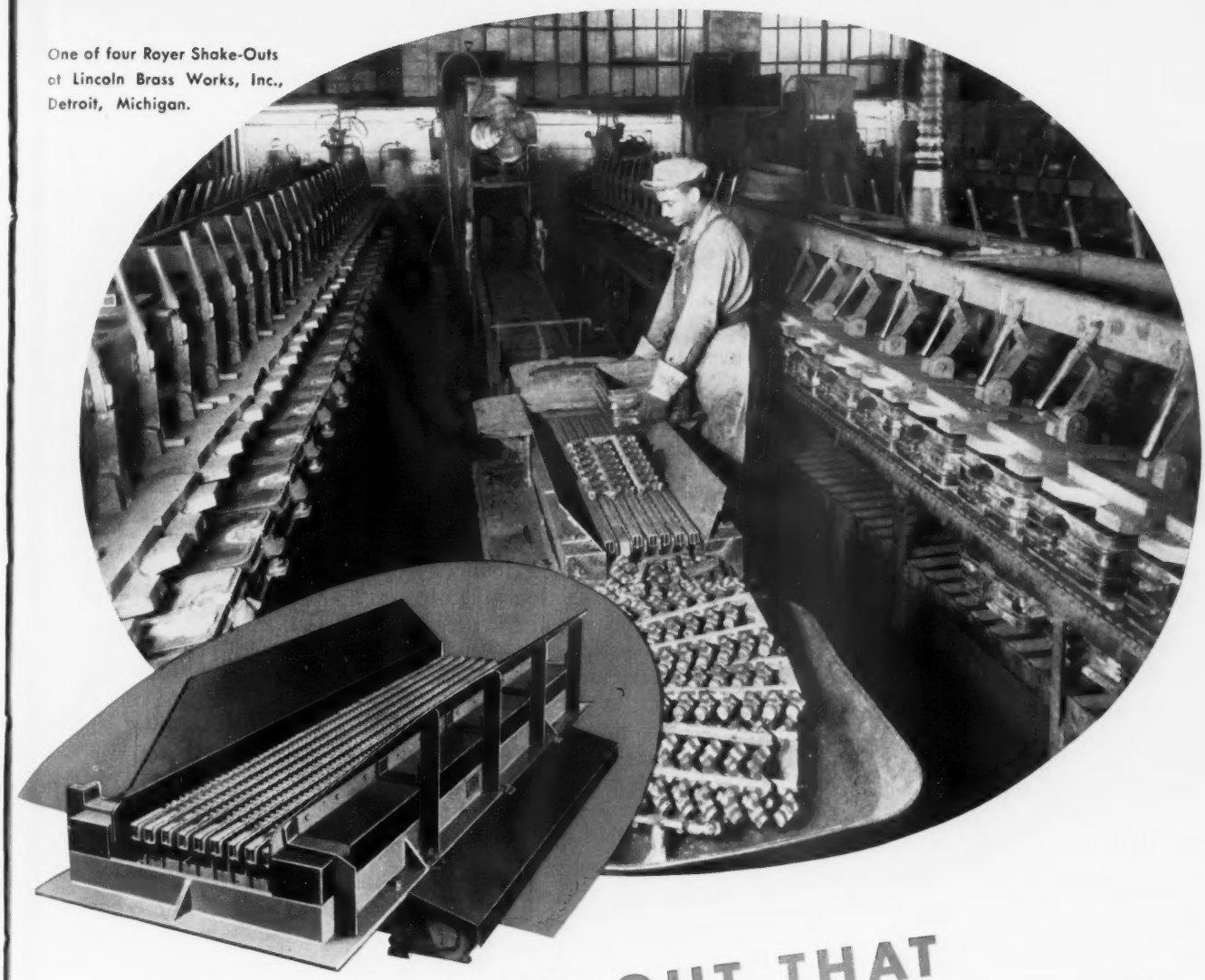

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(*Concluded from page* 132)

stream. That condition, in combination with the chilling effect of the die, would result in holes just under the surface. It may be that the method of distributing the molten metal over the die surface may be a partial cause. Perhaps arranging the die so it can be gradually tilted may provide a smooth uniform flow of metal over the die surface.

If, as earlier mentioned, the die surface is not clean in the chemical or metallurgical sense, it might be possible to overcome the trouble by applying a thin coating of a refractory such as used in producing permanent mold castings. The coating, of course, would have to be removed entirely before the die is placed in use, but we believe it can be accomplished with fine steel wool and plenty of elbow grease. A suggested wash is composed of 1 gal water (boiling) to which is added 7 oz 40 per cent sodium silicate, 5 oz whiting and ¾-oz of rouge or graphite. Solution is cooled before use, and should be stirred prior to application on the mold face, which should be at a temperature around 600° F. Spraying on the coating is preferable to brushing.

It appears that you would have much better success in producing this male die by use of the plaster molding process. One procedure would be to ram up a cope of fine sand directly on the cast iron die, and pour the casting plaster over that to form the mold. The other method would be to make a plaster cope on the die, and the mold from that.

Little Change in Lining Life

QUESTION We are melting from 6 to 9 tons a day in our cupola, which is lined to 42 in., and have only had to reline it once a year. Would it be harder on the lining if we were to use a 30 per cent steel mixture?

ANSWER In our opinion the change of your metal charges to include 30 per cent steel scrap should make little if any increase in refractory consumption, provided you do not make any radical changes in melting procedure. Use of steel scrap in the mixture will require some additional coke—about 3 lb per 100 of steel added—to supply additional carbon for absorption by the steel, but we doubt that any other changes will have to be made.

Developing a Synthetic Sand

QUESTION We are having trouble with our molding and core sand, and would like to know what is a good mixture as to bond (bentonite), water, etc., for nonferrous molding sand in 1000-lb batches. What permeability should it be (150 mesh)? Using the same silica sand, what is a good mixture for cores?

ANSWER Development of a synthetic-type molding sand suitable for use in any particular foundry involves a considerable amount of experimental work to provide the desired characteristics or properties which vary somewhat from shop to shop. It is unfortunate that you did not mention your present practice and what troubles you are having — information which would have been helpful in suggesting possible changes.

The only thing we can do is to offer a possible starting point from which you will have to carry on. We suggest that you try only small batches of about 100 lb on a variety of castings until you determine the best combination of bond, moisture, etc., which will answer your needs satisfactorily, and then go to the larger batches.

Try a mixture on a weight basis of 100 sand, 2 western bentonite and 2 southern bentonite with about 3.5 per cent moisture. Observe results obtained, and then make adjustments as required. Permeability will have to be determined after the sand is mixed, and the only way of predetermining that is through the fineness of the sands—rather roughly—since the coarser the sand the higher the permeability. We can only guess at the permeability of the sand mix suggested as being around 30.

The 150 mesh sand you mention is much too fine for cores, and we know you will have much less trouble by using a sand with a fineness of 60 to 70 such as is found in the lake sands available and commonly used in your area.

Aluminum and Gray Iron Sands

QUESTION What mixture of sand would you recommend for making aluminum patterns? We have only No. 1 Albany on hand; would adding No. 00 or Windsor Lock sand give a better finish? Please specify the most desirable AFS fineness number, moisture, clay and permeability. We have been making quite a few nice patterns in aluminum for our own use, and feel that with the correct sand we might make all our patterns. What aluminum alloy is best for pattern work? Also could you give us a dry sand mix for 16 to 24-in. gate valve bodies poured in gray iron? We currently use, without much luck, a mixture containing 300 lb new sand, 600 lb heap sand, 6 qt wheat flour, tempered to 6 per cent with one-half water and one-half glutrin.

ANSWER As you undoubtedly know, the finer the sand the smoother the surface obtained on castings, but as the fineness increases the permeability decreases with increasing tendency toward blows. Hence, the foundryman has to compromise and use the finest grain size which will not cause blows. As might be expected, a No. 00 Albany with an AFS grain size of 210 to 260 or so will produce a much smoother surface than the No. 1 grade. Properties of the former sand will be around 6 to 8 psi green compression strength; 5 to 15 permeability; 15 to 22 per cent clay; water 6 to 7 per cent.

As far as aluminum alloys for patterns are concerned, it appears that a number are in use. However, one prominent patternmaking firm prefers a 3 per cent Si-5 per cent Cu alloy.

It is unfortunate that you did not mention what difficulty you are having with the dry sand mixture you are using since we might have been able to suggest improvements. A synthetic sand suggested for dry sand work contains 60 lb old sand, 20 lb new sand (54 to 60 AFS fineness), 20 lb bank sand (90 to 130 AFS fineness), 3 lb western bentonite, 3 lb fireclay, 2 lb pitch, and 7 per cent moisture. Another is 200 lb old sand, 160 lb lake sand (50 to 60 AFS fineness), 6 lb fireclay, 6 lb western bentonite, 1 lb southern bentonite, 6 lb pitch, and 7 per cent moisture.

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ELECTROMET Data Sheet

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COLUMBIUM and TANTALUM

Strategic Combination for Imparting Strength and Stability to High-Temperature Metals

Gas turbines for jet-aircraft engines, and for other similar engines being developed for marine and railway transportation, have greatly increased the demand for high-temperature metals. The present most satisfactory metals are either iron-base, nickel-base, or cobalt-base. They are used in the form of castings and hot-worked products, such as forgings, bars, and sheets.

Many of these special metals contain columbium because of its beneficial effect on high-temperature strength in both cast and wrought products. Investigations have shown that columbium is one of the key alloys for imparting high-temperature strength and stability in metals suitable for operating temperatures up to 1500 deg. F. and above.

Need for New Alloy

Originally, a ferrocolumbium alloy containing approximately 55 per cent columbium and 5 per cent tantalum was employed in the production of many of these high-temperature metals. However, with the increased use of high-temperature metals and columbium-bearing 18-8 stainless steels, it became necessary to utilize the tantalum-rich columbium ores.

ELECTROMET's Research Laboratories investigated whether an alloy containing more tantalum and less columbium would be equally satisfactory for producing the high-temperature metals. Columbium and tantalum alone, as well as combination alloys of columbium plus tantalum, were tested.

Results of Tests

The alloy N-155 was selected for tests. It is an iron-base alloy with the following approximate analysis:

Chromium	20 per cent
Nickel	20 per cent
Cobalt	20 per cent
Tungsten	3 per cent
Molybdenum	2 per cent
Columbium	1 per cent
Nitrogen	0.15 per cent
Carbon	max. 0.35 per cent

The data in the table below describe the mechanical properties, at room temperature, of this low-carbon N-155 alloy modified with columbium and tantalum alone, and with combinations of columbium plus tantalum. The metal modified with columbium has good strength and high ductility at room temperature. These same good properties are obtained when tantalum, or tantalum plus columbium, is substituted for the columbium.

Stress-to-rupture tests were also conducted on these same modified low-carbon N-155 alloys at 1350 and 1500 deg. F. The data show (see table) that when the columbium is replaced with a mixture of columbium plus tantalum, the strength of the metal remains substantially unaffected at 1350 and 1500 deg. F. Also, when all of the columbium is replaced with tantalum, the strength of the metal at 1500 deg. F. is equivalent to that obtained with columbium. Hence, from the standpoint of high-temperature strength, columbium and tantalum can be used interchangeably, or in combination.

Help to Industry

ELECTROMET has developed an alloy containing approximately 20 per cent tantalum and 40 per cent columbium for use in high-temperature metals and stainless steels. It is known as ELECTROMET ferrotantalum-columbium.

Industrial experience with this alloy has confirmed the favorable results of the experimental work. The alloy has already aided considerably in augmenting the supply of columbium alloys, since it is just as effective as ELECTROMET ferrocolumbium, with 50 to 60 per cent columbium, for giving strength at high temperatures.

It should be added to a thoroughly deoxidized metal bath to obtain the best results. A recovery of about 90 per cent for the columbium and 80 per cent for the tantalum may be expected.

For further information regarding alloys for high-temperature metals, write to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Houston, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

Properties of Modified N-155 Alloys Compared*

Typical Analysis, %**	With Columbium	With Columbium and Tantalum		With Tantalum
Columbium	1.13	0.58	0.49	....
Tantalum	0.08	0.64	0.33	1.47
Carbon	0.12	0.13	0.13	0.12
Nitrogen	0.13	0.14	0.14	0.14
At Room Temperature				
Tensile Strength, psi	119,000	123,200	117,500	122,100
Yield Strength, psi	56,700	59,500	52,000	59,100
Elongation in 2 in., %	52	47	57	54
Reduction of Area, %	69	65	69	56
At 1350 deg. F.				
Stress to Cause Rupture, psi				
In 100 hr.	31,000	34,000	33,500	....
In 1000 hr.	23,000	25,000	23,000	....
At 1500 deg. F.				
Stress to Cause Rupture, psi				
In 100 hr.	20,000	20,000	20,500	20,000
In 1000 hr.	15,000	14,000	15,500	15,000

*Tests made on standard samples from one-inch round bars, water-quenched from 2250 deg. Fahrenheit.
**Composition of the base alloy is given in the text.

The term "Electromet" is a registered trademark of Union Carbide and Carbon Corporation.

Men of Industry

WILLIAM S. PELLINI, formerly head of the Metal Processing Branch of the Division of Metallurgy, Naval Research Laboratory, Washington, has been named superintendent of the division. In his new position Mr. Pellini will supervise research and development in the fields of founding, welding, physical metallurgy, high-temperature alloys, titanium and metal corrosion.

♦ ♦ ♦

James D. Voss has been appointed chief metallurgist, Hamilton Foundry & Machine Co., Hamilton, O., in charge of melting, sand preparation and laboratory operations. Mr. Voss attended the University of Cincinnati as a co-operative student under a Foundry Educational Foundation scholarship and was graduated in 1950 as a metallurgical engineer. He joined Hamilton Foundry in 1952 as a metallurgist.

♦ ♦ ♦

Harold C. Templeton, for the past year assistant metallurgist, Lebanon Steel Foundry, Lebanon, Pa., has been appointed chief metallurgist. A graduate of Colorado School of Mines, he was previously associated with Babcock & Wilcox Co., New York. **Raymond W. Patridge,** with the company since 1951, has become service manager. Mr. Patridge was graduated from Ohio State University and was formerly with Bonney-Floyd Co., Columbus, O. **Roy W. Daub,** who has been with the company 19 years, has been named chief planning engineer.

♦ ♦ ♦

Joseph Prendergast, who in 1951 was sent to Europe as a special foundry consultant for what was then the Economic Co-operation Administration, Washington, has been elected a member of the Institute of British Foundrymen. Mr. Prendergast, who is now foundry consultant with the United States Foreign Operations Organization, is at present located at 62, Via Veneto, Rome.

♦ ♦ ♦

Alfred J. Bzdula has been appointed sales representative in Michigan and northern Ohio for General Electric Co.'s Chemical Division, Pittsfield, Mass. with headquarters in Detroit. Mr. Bzdula was graduated from University of Notre Dame and joined the company in 1949. **John B. Hinds Jr.** will represent the Chemical Division in the Chicago area. He attended Drexel Institute of Technology and joined the chemical materials department last year. Previously he was superintendent-manager, St. Lawrence Foundry & Machine Co., Ogdensburg, N. Y. Messrs. Bzdula and Hinds will supply foundries in their areas with resins for shell molding, core binders and silicone release agents.

♦ ♦ ♦

Collin F. Stevens, until recently associated with Corn Products Refining Corp., in Boston, has been appointed metal finishing sales representative in the Buffalo office, Frederic B. Stevens Inc., Detroit. **Elmer F. King** has been named representative for the metal finishing sales division in the New England area. He was graduated from University of Bridgeport last year.

♦ ♦ ♦

William L. Gillespie has been appointed Chicago district sales manager, Hooker Electrochemical Co., Niagara Falls, N. Y., succeeding **Charles Y. Cain,** who has been named manager of plastics sales. Mr. Gillespie joined the company in 1939 after graduating from Alfred University. **Victor M. Morgan** has been named sales representative to replace Mr. Gillespie in the midwest territory, with headquarters in the Chicago office.

♦ ♦ ♦

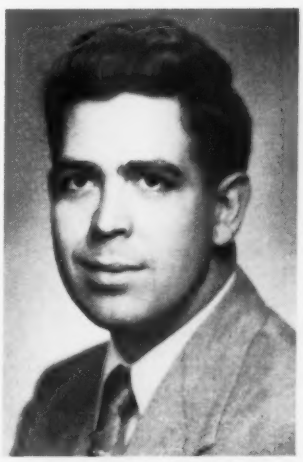
Augustine R. Marusi has been named president of the Chemical Division, Borden Co., New York, succeeding **William F. Leicester,** president since 1944, who will continue as chairman of the division's directing board and as a vice president of

(*Continued on page* 140)

WILLIAM S. PELLINI
. . . *division superintendent*

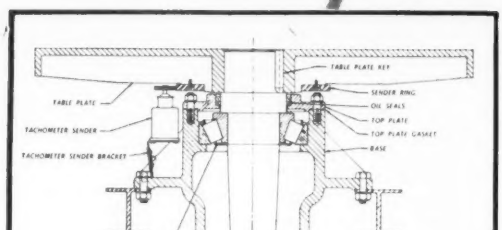
JAMES D. VOSS
. . . *chief metallurgist*

HAROLD C. TEMPLETON
. . . *chief metallurgist*

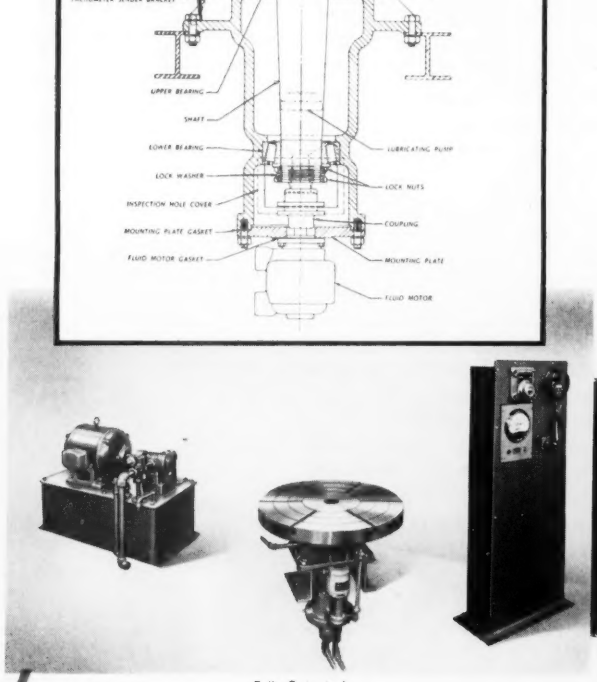


RAYMOND W. PATRIDGE
. . . *service, Lebanon Steel*

Another HERMA



Here is one unit in the complete line of HERMAN Molding Machines, in all types and sizes, to fit all foundry operations.



Fully Patented

HERMAN MOLDING MACHINES

t work

THE Herman Hydro-Centrifugal Casting Machine, because of its hydraulic powering, has a high degree of versatility to meet a variety of operating conditions.

There are an even dozen reasons why it should be seriously considered, if you are looking for modern casting production by the centrifugal method.

Here are the reasons:

1 Machines controlled and operated entirely by hydraulic power.

2 Smooth stepless variance of table speeds from minimum to maximum.

3 Single control for starting, braking stopping, and reversing.

4 Tachometer indicates actual r.p.m. of table plate.

5 Variable acceleration and deceleration of rotative speeds to most efficiently suit requirements.

6 Table Spindle connected directly to fluid motor.

7 Only one power unit necessary to operate several machines.

8 Mechanically lubricated; no manual oiling required.

9 Power unit remotely installed insuring protection from operation hazards.

10 Flow and volume of oil automatically controlled providing overload protection.

11 Instantaneous setting of rotative speed by dial control on flow valve.

12 All wearing parts completely enclosed providing protection from foreign matter.

This Hydro-Centrifugal Casting Machine is another in the complete Herman line . . . . . a type and size for all foundry operations.

He the HERMAN vertical
ydrntrifugal casting machine

Further information will be gladly supplied. Catalog on request.

ES MR WAY BY THE WAY THEY'RE MADE

MEMBER FEMA

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

Mr. Kingseed says:

"We have achieved outstanding production from our HERMAN Molding Machines. The four Herman Vertical Hydro Centrifugal Casting Machines in use in our plant are ideal for our type of castings.

It is also our feeling that the installation of these Herman machines has helped to improve the quality of our castings and has cut our defective castings to a minimum. This is in line with our continuous efforts to use the most modern and the most efficient equipment.

We have always found that these Vertical Hydro Centrifugal Casting Machines, as well as other Hermans in our plant, give us rugged, dependable service even under the most rigid production schedules."

Foundry Superintendent
Farrell-Cheek Steel Co.
Sandusky, Ohio

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

(*Continued from page* 137)

the company. Mr. Marusi joined the Chemical Division's research laboratory in Bainbridge, N. Y., 15 years ago. He was head of the company's Brazilian operation until 1952, when he was transferred to New York as vice president in charge of eastern operations for the Chemical Division.

♦ ♦ ♦

Harry C. Ballman has been appointed executive secretary, Air Pollution Control Association, Pittsburgh. Mr. Ballman attended University of Cincinnati and since 1949 has been smoke regulation engineer in Columbus, O. He is a member of the association's waste disposal committee and one of its directors.

♦ ♦ ♦

Wayland S. Bowser, controller, Blaw-Knox Co., Pittsburgh, has been appointed chairman of the Social Security Committee, Controllers Institute of America, New York. **J. B. Lanterman,** vice president-controller, American Steel Foundries, Chicago, has been named chairman of the institute's Corporate Accounting Procedures and Reports Committee.

♦ ♦ ♦

Zigmond Madacey, formerly assistant foundry manager, Caterpillar Tractor Co., Peoria, Ill., has been named field service manager, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago. In 1920 Mr. Madacey joined Lakey Foundry & Machine Co., Muskegon, Mich., where he became coreroom supervisor. He joined Caterpillar in 1930 in that capacity and in 1942 he set up the aluminum foundry there. Following the war, when aluminum operations were suspended, he became superintendent and later assistant foundry manager of the iron foundry. Mr. Madacey was active in organization of the Central Illinois Chapter of the AFS and was its first chairman. He has been a frequent lecturer and author in foundry circles.

♦ ♦ ♦

John D. Riley has been appointed Cleveland district manager, Link-Belt Co., Chicago, succeeding the late Paul Wheeler. Mr. Riley attended University of Pennsylvania and joined the company's Philadelphia plant in 1934. He was transferred to the Boston office in 1939 and recently has been district manager in Newark, N. J. **Harry G. Andersen,** new district manager in Newark, has been district manager in Birmingham for 3 years. Mr. Andersen, who attended Northwestern University, Illinois Institute of Technology and University of Wisconsin, joined the company's Chicago plant in 1937, later working in the Chicago sales office. He was transferred to Milwaukee in 1948 as district sales engineer.

♦ ♦ ♦

Richard E. Miller has been appointed product sales manager in charge of saws and expendable tools, Rockwell Mfg. Co., with headquarters in Pittsburgh. Mr. Miller, a graduate of Duke University, joined Rockwell in 1947 as a market analyst and successively became assistant to the vice president, assistant general manager, sales manager, and more recently acting general manager of the company's Columbus, O., plant.

♦ ♦ ♦

Henry G. Stenberg, recently elected president of the New England Foundrymen's Association for the current year, is foundry superintendent, Draper Corp., Hopedale, Mass. While attending Wentworth Institute and University of New Hampshire, Mr. Stenberg worked during the summer at Hamlin Brass Foundry, Union, N. H., and Universal Winding Co., Providence, R. I., as an apprentice molder. From 1931-1937 he was foundry foreman, Warren Pipe & Foundry Co., Everett, Mass., and for the next 3 years he held a similar position with Draper Corp., Hopedale, Mass. After a year with Rice, Barton Corp., Worcester, Mass., as foundry superintendent, Mr. Stenberg returned to Draper Corp., at East

(*Continued on page* 142)

Joins Staff of *Foundry*

Kenneth L. Mountain has been made assistant editor of FOUNDRY. Mr. Mountain, a native of Cleveland, was graduated from the School of Journalism, Ohio State University, in 1949, following four years' service with the Air Force in this country and in England. At that time

he joined the business staff of FOUNDRY as reader's service and circulation manager. He resigned in September, 1950, to become assistant director of the Ohio Union, a student social and recreational center at Ohio State University.

ZIGMOND MADACEY
. . . joins Beardsley & Piper

JOHN D. RILEY
. . . Cleveland mgr., Link-Belt

HARRY G. ANDERSEN
. . . Link-Belt mgr., Newark

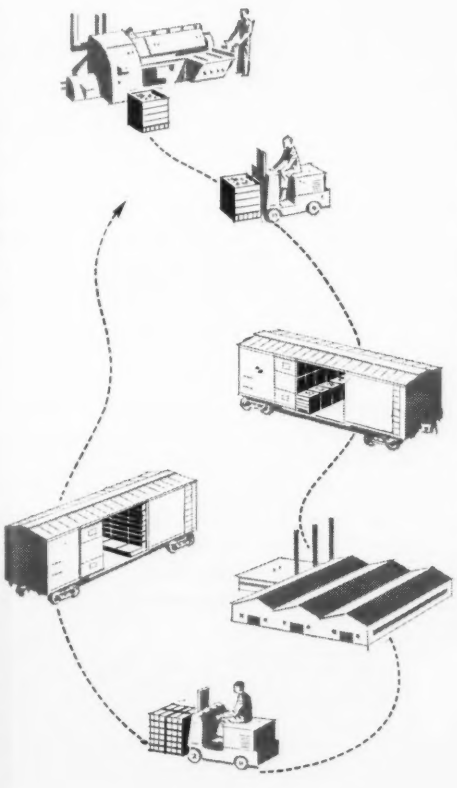
HENRY G. STENBERG
. . . elected president, NEFA

The Collaps-a-tainer is illustrated in the fully assembled and fully collapsed positions. Standard box size, 30" wide x 30" long x 30" deep.

Here's the Newest Development in Materials Handling Equipment for Interplant Shipping

Collaps-a-tainer

PATENTS APPLIED FOR



Republic Materials Handling Engineers designed the Collaps-a-tainer to meet an ever-growing demand of interplant shippers for a returnable container that could be used on the production line or as a storage bin.

Shippers' requirements for this unit were strict. It had to be easy to assemble, lightweight, but strong and durable; easy to knock down, stack safely, and be so economical that handling costs would be drastically reduced. The Collaps-a-tainer meets each of these requirements.

This newest development in materials handling equipment is designed to make more trips than any other lightweight box. It is built to give maximum strength with minimum weight. Tests have proved that Republic's new design withstands more abuse for a longer period of time than any lightweight box.

The Collaps-a-tainer can be stacked to any practical height. Four collapsed units can be shipped in the same space formerly required for one upright container. The Collaps-a-tainer is available with two or four-way entry.

A Republic Materials Handling Engineer will be glad to discuss your interplant shipping problems with you. There is no cost or obligation for this service. For more information on the Collaps-a-tainer write for Booklet 615.

REPUBLIC STEEL CORPORATION
Pressed Steel Division
6208 Truscon Avenue, Cleveland 27, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

The Collaps-a-tainer is filled at the manufacturing plant and shipped by freight car or truck to the assembly plant. After unloading, the Collaps-a-tainer is quickly and easily folded into a compact unit for return shipment.

REPUBLIC STEEL

REPUBLIC
MATERIALS HANDLING EQUIPMENT

(*Continued from page* 140)

Spartanburg, S. C., as foundry superintendent and in 1944 was appointed foundry superintendent for the company in Hopedale.

♦ ♦ ♦

Raymond Szymanowitz, formerly vice president, has been appointed executive vice president, Acheson Industries Inc., New York.

♦ ♦ ♦

William F. Rochow, recently vice president in charge of technical sales and research, Harbison-Walker Refractories Co., Pittsburgh, has been named assistant to the president—research and development. Mr. Rochow joined the company in 1912 following graduation from Pennsylvania State College. After about 10 years in sales work he turned his attention to application of refractories and holds various patents on refractory compositions and constructions.

WILLIAM F. ROCHOW
. . . *refractories research*

EMIL D. SQUIRE
. . . *joins Western Metal Co.*

ARTHUR TOWNHILL
. . . *Alloy Engineering research*

DANIEL J. COCKRELL
. . . *magnetic equipment sales*

♦ ♦ ♦

Paul Diserens, consulting engineer, Worthington Corp., Harrison, N. J., was recently honored at a luncheon given by the company upon the occasion of his retirement, following 45 years of service. A graduate of Purdue University, Mr. Diserens joined Worthington in 1909 as engineer of test in charge of research at the Cincinnati works. In 1919 he went to New York as assistant chief engineer and became chief consulting engineer in 1928. He was director of research and development from 1945 until 1952.

♦ ♦ ♦

Ralph C. Gough, formerly New England representative, Joseph Dixon Crucible Co., Jersey City, N. J., has been appointed northeast district manager with headquarters in Boston. **R. E. Goodfriend,** named Atlantic district manager, will be stationed in Philadelphia. **Emory C. Bleam** has been made central district manager with headquarters in Chicago, and **R. C. Brock** continues as western district manager in San Francisco.

♦ ♦ ♦

Emil D. Squire has been appointed representative in eastern Michigan for Western Metal Co., Chicago. With headquarters in Detroit, where the company recently opened a warehouse under his supervision, Mr. Squire will handle the company's line of brass, bronze and aluminum ingots.

Arthur Townhill has been appointed associate director of the Casting Potentials Project, AMC-USAF, at Alloy Engineering & Casting Co., Champaign, Ill., which is conducting castings research and development projects for the U. S. Air Force. Mr. Townhill received his master's degree in metallurgy from Case Institute of Technology. Since 1930 he has been associated with Thompson Products Inc., Cleveland. Prior to that he was affiliated with Aluminum Co. of America, Cleveland, Lycoming Mfg. Co., Williamsport, Pa., and General Motors Research Corp., Detroit.

♦ ♦ ♦

John E. Langhaus was recently appointed foreman molder, Charleston Naval Shipyard Foundry, Charleston, S. C. In 1941 Mr. Langhaus began his apprenticeship at New York Naval Shipyard, Brooklyn, N. Y., and since 1951 has been leadingman molder there.

♦ ♦ ♦

Clyde M. Adams, secretary, Bohn Aluminum & Brass Corp., Detroit, has been appointed deputy director of the Aluminum and Magnesium Division, Business and Defense Services Administration, Washington, succeeding **Everett G. Fahlman,** president, Permold Co., Medina, O., who has returned to his company. Mr. Adams attended University of Kansas and has been with the Bohn Aluminum company since its formation in 1924. He has been secretary since 1949.

♦ ♦ ♦

Daniel J. Cockrell has been appointed sales manager, Magnetic Engineering & Mfg. Co., Clifton, N. J., where he will continue as export manager. Prior to joining the company in 1951, he was branch manager in the Middle East for United States Rubber Co., New York, and initiated and expanded European offices for Hewitt-Robins Inc., Stamford, Conn.

♦ ♦ ♦

Maurice C. Sandes, until recently training co-ordinator at the Mare Island Navy Yard Foundry, Vallejo, Calif., has been named field representative with the State Department of Industrial Relations, Division of Apprenticeship Standards, Oakland, Calif., where he will handle apprentice problems, including the molding and coremaking trades.

♦ ♦ ♦

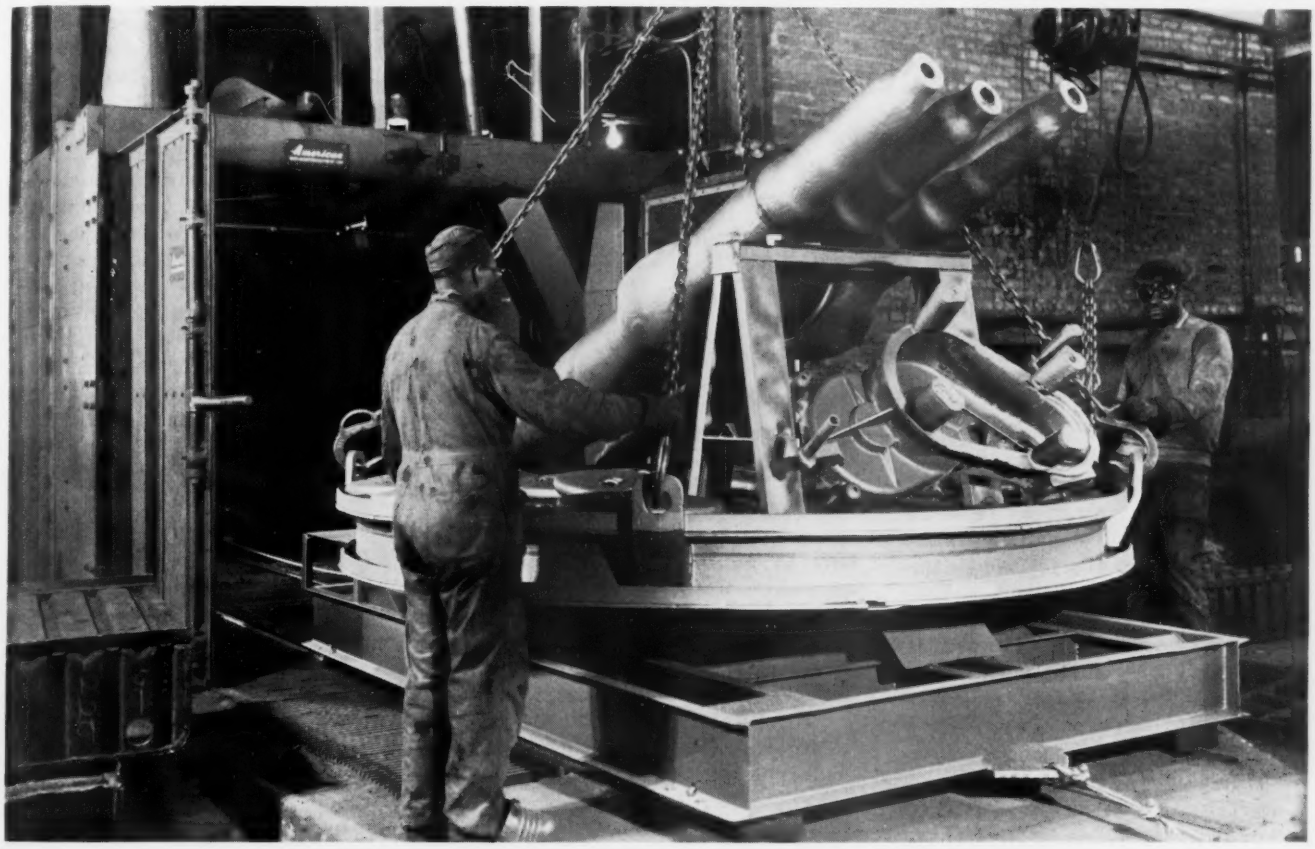
Garth S. Thompson was recently appointed president-general manager, Misco Fabricators Inc., Detroit, heat and corrosion resistant industrial equipment.

♦ ♦ ♦

David Reid Jr. has been appointed manager, Abrasive and Bond Plants, Norton Co., Worcester, Mass., succeeding **Albert E. Hall** who has retired. **Robert G. Clarke,** who has been assistant superintendent of the plants, has succeeded Mr. Reid as superintendent. Mr. Reid joined the

(*Continued on page* 144)

pioneering developments keep **WHEELABRATOR®** *first in blast cleaning*



cleaning steel castings weighing up to 8000 lbs. in 12 minutes

Wheelabrator Car-Type Room Slashes Airblast Cleaning Time 40%

If you are still depending upon costly, unhygienic airblasting for cleaning large, bulky castings, you can profit by the experience of a prominent Chicago steel foundry. They recently replaced a large airblast room with an airless Wheelabrator Car-Type Room with these profitable results:

(1) Immediate reduction of 28 manhours daily in direct cleaning room labor.

(2) Castings weighing up to 8000 lbs. are cleaned in just 12 minutes—a small fraction of former time.

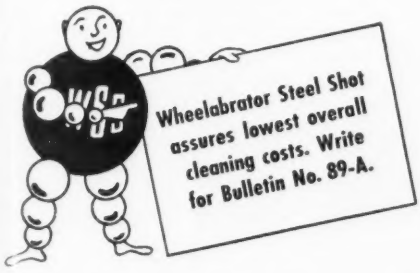
(3) Chipping and grinding costs drastically reduced due to the improved surface cleanliness of the work.

(4) Working conditions greatly improved.

(5) Cleans many castings not economically feasible by airblasting.

You, too, can transform your slow and costly airblasting into a high production hygienic, low cost operation with a Wheelabrator Room. *American* engineers, long experienced in de igning machines for special applications, have developed many different sizes and types of such units to meet practically any cleaning requirement.

Let us tell you how you can profit with a Wheelabrator Room for your difficult cleaning problem. Write today for a copy of Bulletin 854 which describes numerous machine designs and includes many actual job-study reports.



American Wheelabrator®
WHEELABRATOR & EQUIPMENT CORP.
AIRLESS BLAST CLEANING

505 S. Byrkit St., Mishawaka, Ind.

Manufacturers and Selling Agents: CONTINENTAL EUROPE—George Fischer, Ltd., Schaffhausen, Switzerland; BRITISH COMMONWEALTH—Tilghman's Patent Sand Blast Co. Ltd., Broadheath, England; JAPAN—Tokyo Boeki Kaisha, Tokyo; BRAZIL and ARGENTINA—Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; AUSTRALIA—McPherson's, Melbourne; MEXICO—Casco, S. De R. L., Mexico, D.F.

(*Continued from page* 142)

company in 1935 and in 1944 was transferred to the research laboratory. Mr. Clarke, a graduate of Massachusetts Institute of Technology, has been with Norton since 1936. Mr. Hall joined the experimental department of the abrasive division in 1920.

♦ ♦ ♦

Gen. Clinton F. Robinson has been named president and a director, Borolite Corp., Niagara Falls, N. Y. **Kenneth D. Mann** and **Dr. Paul Schwarzkopf** have been elected vice presidents and directors. General Robinson is president, the Carborundum Co., Niagara Falls, N. Y., Mr. Mann, president, Firth Stirling Inc., Pittsburgh, and Dr. Schwarzkopf, president, American Electro Metal Corp., Yonkers, N. Y. Borolite Corp. was recently formed by the three companies for research, manufacture and sale of borides, carbides and aluminide products. **Edward A. Montgomery** has been named secretary and **Willis T. Windle** treasurer-controller of the new company. They hold similar positions with the Carborundum Co.

♦ ♦ ♦

Bernie H. Marks, recently sales engineer in the Detroit office, Pangborn Corp., Hagerstown, Md., has been appointed manager of the Houston, Tex., office, recently opened there by the company. Mr. Marks, a graduate of University of Texas, joined Pangborn in 1948.

♦ ♦ ♦

Herbert H. Clarke Jr., since 1951 vice president in charge of West coast operations in Seattle, has been named vice president-general sales manager of the Chemical Division, Borden Co., in New York. Mr. Clarke joined the Chemical Division in 1940 and in 1946 became sales manager of the western area. **William R. Moffitt,** for the past year assistant western manager and technical director, has become manager of West Coast operations. With the company since 1939, Mr. Moffitt became assistant to the general works manager at the Seattle plant in 1951 and was named general works manager there the following year.

B. A. MILLER, vice president-superintendent, Crown Non-Ferrous Foundry Inc., Chester, Pa., as reported in March

♦ ♦ ♦

Howard M. Palmer has been appointed sales vice president, Lewis-Shepard Products Inc., Watertown, Mass. Mr. Palmer joined the company in 1945 and for the past 3 years has been general sales manager. He was previously associated with Bethlehem-Hingham Shipyard Inc., Hingham, Mass., in materials handling work. Mr. Palmer was president of the Materials Handling Institute in 1953.

♦ ♦ ♦

Thomas Butler has been appointed special engineering representative, Claude B. Schneible Co., Detroit, where he will be available for consultation on installation of dust collecting systems for foundry operations. Mr. Butler was associated for many years with the plant engineering department of Ford Motor Co.'s Rouge Plant, Dearborn, Mich.

♦ ♦ ♦

W. J. Ulrich has been elected a vice president, the Carborundum Co. Niagara Falls, N. Y., continuing as senior sales representative in the Detroit area. **F. W. Bonacker** has been named assistant vice president-sales for the Bonded Products and Grain Division, Niagara Falls. **John F. Claydon** is director of the industrial sales branch and **H. P. Dales,** industrial sales manager, Coated Products Division, Wheatfield, N. Y. **J. A. Decker** is manager of the Middle Atlantic sales district comprising the former New York and Philadelphia districts. Other appointments as district sales managers include **W. D. Dickerson,** Detroit, and **H. C. Smith,** St. Louis.

♦ ♦ ♦

L. H. McReynolds has been named manager of public relations, Jeffrey Mfg. Co., Columbus, O., succeeding **W. B. Montague,** who has resigned. Mr. McReynolds has been with the company 33 years. **A. J. Mahoney** continues as sales promotion manager and **Nevin J. Rodes** has charge of business paper advertising.

♦ ♦ ♦

Thomas H. Pattison, since 1937 plant metallurgist, Mackintosh-Hemphill Co., Pittsburgh, has been appointed superintendent of operations at the Garrison Plant there. Mr. Pattison joined the company in 1920. **John B. McGlade,** assistant plant metallurgist, has become plant metallurgist. **Charles W. Barker** has been named assistant plant metallurgist. **Oliver B. Douthett,** who has been general foreman of the roll foundry, has

(*Continued on page* 147)

BERNIE H. MARKS
. . . Pangborn sales, Houston

HERBERT H. CLARKE JR.
. . . chemical sales, Borden Co.

THOMAS BUTLER
. . . joins Schneible company

THOMAS H. PATTISON
. . . Mackintosh-Hemphill supt.

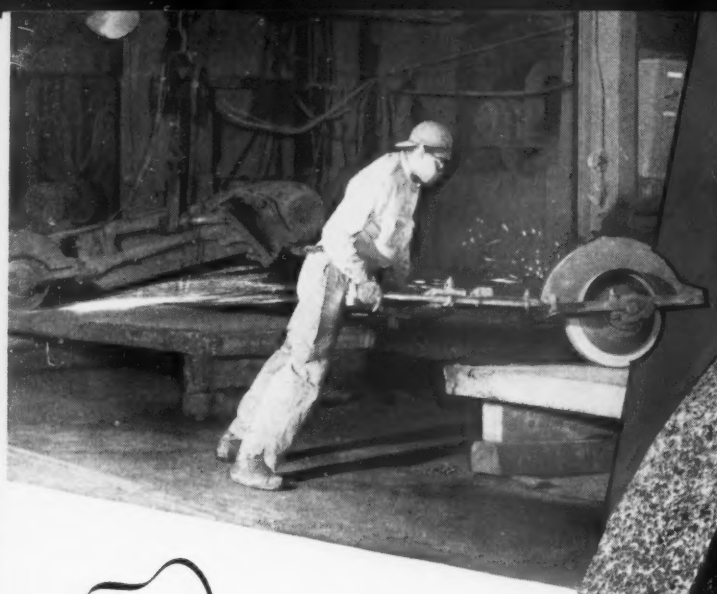
AMASTEEL

GENUINE ALLOY STEEL SHOT

This blast material is not chilled iron —it is shot made of genuine alloy steel. The pellets are so hard and firm they keep on working and cleaning long after other shot types have broken down. Excessive wear on the cleaning machine is due to the action of shot "fines" which lack cleaning power. AMASTEEL produces very little "fines", and as a result reduces maintenance costs. AMASTEEL will clean all types of metals as fast or faster than regular shot; moreover, the cleaned work will resist rust much longer because of the lack of iron dust on the surface. AMASTEEL is a high quality blasting agent for producing high quality cleaning, and it lasts many times longer. It spells Economy with a capital E. We have the answers to a long list of blast cleaning problems, so please feel free to consult with us at any time. No obligation, of course.

ALLOY METAL ABRASIVE CO.

311 W. Huron St., Ann Arbor, Mich.



Chipping of wheel sides and center hole edges prevented by built-in circular steel flanges lining part of wheel center hole.

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GRINDING WHEELS

mean top production in SWING FRAME GRINDING

Fast stock removal! Long wheel life! Less machine upkeep! This adds up to top output with Simonds Resinoid bonded wheels. Exclusive patented Red Streak Flanges give better fit, accurate balance, truer running. Real producers on the business end of *your* swing frame grinders.

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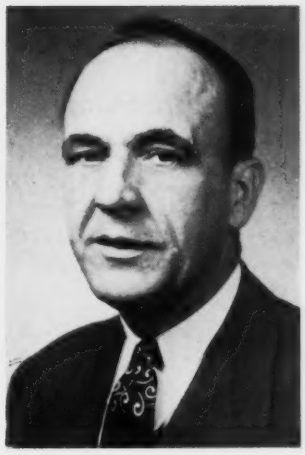
FRANCIS H. HOFFMAN
. . . foundry superintendent

GARVIN A. DREW
. . . Scovill Mfg. vice pres.

CHRIS A. ZANISON
. . . shell molding sales



BRUNO D. HENDRICKSON
. . . Norton abrasive sales

(*Continued from page* 144)

been named general foreman of foundry operations. **I. Robert Jones** is general foreman of fabricating operations.

♦ ♦ ♦

Francis H. Hoffman recently joined Enterprise Wheel & Car Corp., Bristol, Va., as foundry superintendent. Mr. Hoffman attended Newark College of Engineering and was previously associated with Wright Aeronautical Corp., Paterson, N. J., Warwick Malleable Co., Hillsgrove, R. I., and Eclipse Pioneer Foundries Division, Bendix Aviation Corp., Teterboro, N. J. In 1949 he joined the Chattanooga, Tenn., plant of Somerville Iron Works, Somerville, N. J., and since 1951 has been chief engineer.

♦ ♦ ♦

Stanley R. Kuhns, since 1945 manager of Aluminum Co. of America's Cleveland industrial and personnel relations department, has been appointed manager of the company's ingot plant. He replaces **Henry O. Burrows,** superintendent of the ingot plant from 1923 to 1934 and its manager since then, who joins the central metallurgical department. Replacing Mr. Kuhns will be **Lawrence A. Wilson,** recently a member of the industrial relations department of the Pittsburgh office.

♦ ♦ ♦

Jack Palmer, until recently plant manager and chief engineer, Castmaster Inc., Cleveland, has been appointed works manager in charge of production and engineering, U. S. Die Casting Co., Logansport, Ind.

♦ ♦ ♦

Orville H. Scheel has been appointed sales engineer, Hydro-Blast Corp., Chicago, to handle company sales in New York, Pennsylvania, New Jersey, Delaware, Maryland, New England and Ontario.

Garvin A. Drew has been appointed vice president, Scovill Mfg. Co., in charge of sales, service, advertising and sales promotion for its A. Schrader's Son Division, Brooklyn, N. Y. Mr. Drew joined the Schrader organization in 1925 after graduating from Massachusetts Institute of Technology. Following training at the Brooklyn plant, he became a Detroit area salesman and in 1935 was named Pacific Coast manager. Since 1940 he has been general sales manager in Brooklyn.

♦ ♦ ♦

Jack Wright, James N. Rector and **Robert Hile** have been appointed by the Hyster Co., Portland, Ore., to fill sales positions throughout eastern United States. Mr. Wright, with Hyster since 1949, takes over as district manager in the northwestern district with headquarters in Chicago. Mr. Rector, since 1951 manager of the Hyster store in Chicago, moves to Atlanta as district manager of the southeastern territory. Mr. Hile, with the company since 1946 in production and office departments at the Peoria, Ill., plant, becomes general manager of the Chicago retail store.

♦ ♦ ♦

John V. McCarthy has been appointed sales representative in New England, eastern New York and metropolitan New York for Vesuvius Crucible Co., Pittsburgh. Mr. McCarthy is a gradaute of Massachusetts Institute of Technology. He also represents North American Smelting Co., Wilmington, Del.

♦ ♦ ♦

W. C. Wertz has joined Superior Steel & Malleable Castings Co., Benton Harbor, Mich., as Chicago district sales representative. Mr. Wertz attended Illinois Institute of Technology and since 1944 has been associated with the Electro-Motive Division, General Motors Corp., Detroit.

Chris A. Zanison, until recently project engineer in shell molding, R. B. Carolin Foundry & Machine Co., has been appointed sales engineer in shell molding, Mechanical Handling Systems Inc., both of Detroit. Mr. Zanison was previously associated with City Pattern Foundry & Machine Co., Detroit, and Warren Alloy & Machine Co., Warren, Mich.

♦ ♦ ♦

Bruno D. Hendrickson has been named abrasive engineer in charge of the western New York territory for the Norton Co., Worecster, Mass. Since 1945 Mr. Hendrickson has been an engineer in the sales engineering department. He joined Norton in 1929 and worked as a mail boy, order clerk and supervisor before going into sales engineering. He replaces **Edward J. Lalor,** who resigned to become a member of the firm of Oliver Abrasive & Tool Co. Inc., Buffalo, a Norton distributor.

♦ ♦ ♦

F. L. Griffith Jr. has been appointed general sales manager of the Rubber and Conveyors Divisions, Hewitt-Robins Inc., with headquarters at the executive offices, Stamford, Conn. **F. W. Blanchard** has been named manager of operations at the Industrial Rubber Division in Buffalo.

♦ ♦ ♦

G. J. Dekker, until recently St. Louis district manager, Air Reduction Sales Co., New York, has been appointed district manager in Milwaukee, succeeding **S. H. Smith,** who has retired.

♦ ♦ ♦

George Sathre recently was appointed manager of National Lead Co.'s Atlantic branch metal division, succeeding **Henry F. Freiherr,** who retired Mar. 1. Since 1950 Mr. Sathre has been manager of the company's

(*Concluded on page* 150)

With Osborn Rota-Lift's mechanical molding, savings up to 300% and higher are attained in the production of sand molds from large match-plate patterns. Molds are accurate . . . uniform in quality to cut scrap. Operator fatigue is reduced. Costs are less.

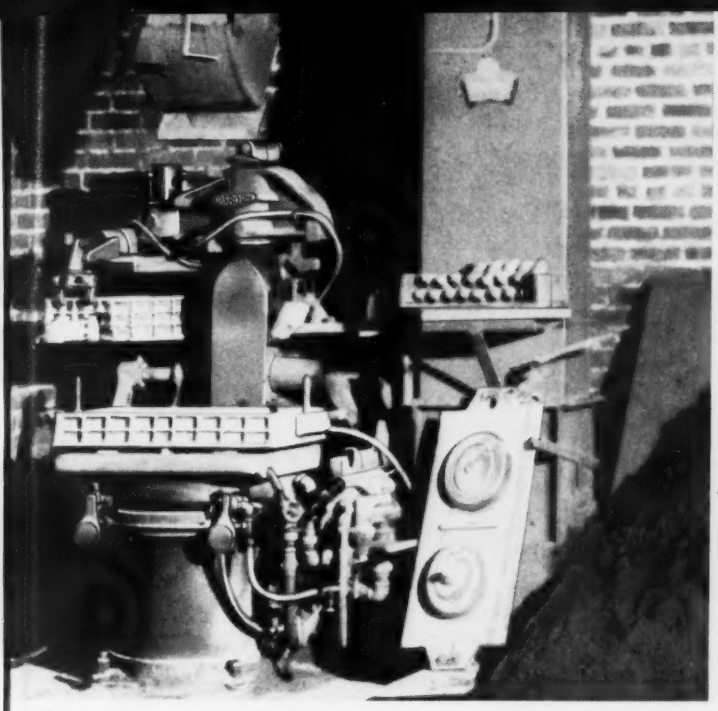
How to make more molds per manhour to cut *your* foundry costs

EFFICIENT production of molds using large match-plate patterns is no longer limited because of manual handling of the mold. Osborn Rota-Lift's mechanical handling features make molding easier and faster to cut your costs. And here's how:

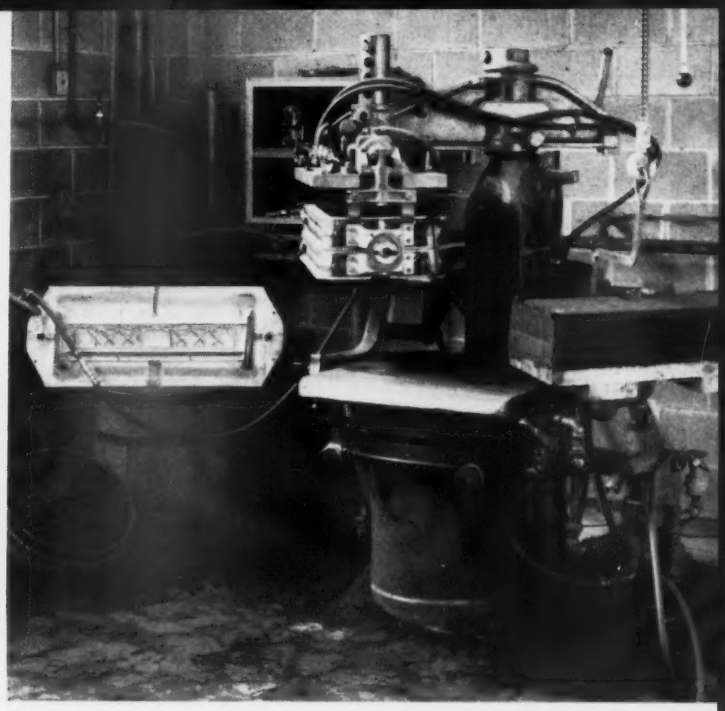
Rota-Lift performs 5 major operations. It jolts, rolls over, squeezes, draws and closes the mold.

After the drag is jolted, Rota-Lift raises the flask on pick-up arms permitting the operator to roll over the flask. After the cope is filled, the head is swung over the mold for the squeeze. Air clamps grip the flask allowing the cope to be drawn mechanically. The drawn cope is swung to one side permitting the operator to remove the match plate from the drag. Cores are set and the cope swung back into position to close the mold.

Production efficiency up 300%. Before Rota-Lift, best production was 32 molds a day per man. Copes and drags were made on separate machines. Now, one man with Rota-Lift makes 100 complete molds a day . . . 68 molds *more* per man per day.



Simplifies molding operations. Before Rota-Lift, copes and drags were turned out on separate machines by 2-man teams. Now both cope and drag are made on one machine . . . the Osborn Rota-Lift.



Nine times the production per manhour. One molder . . . one helper used to turn out 20 molds a day. Replacing with Rota-Lift, this foundry now gets 90 molds a day with one molder . . . no helper.

Mechanizes your large match-plate molding

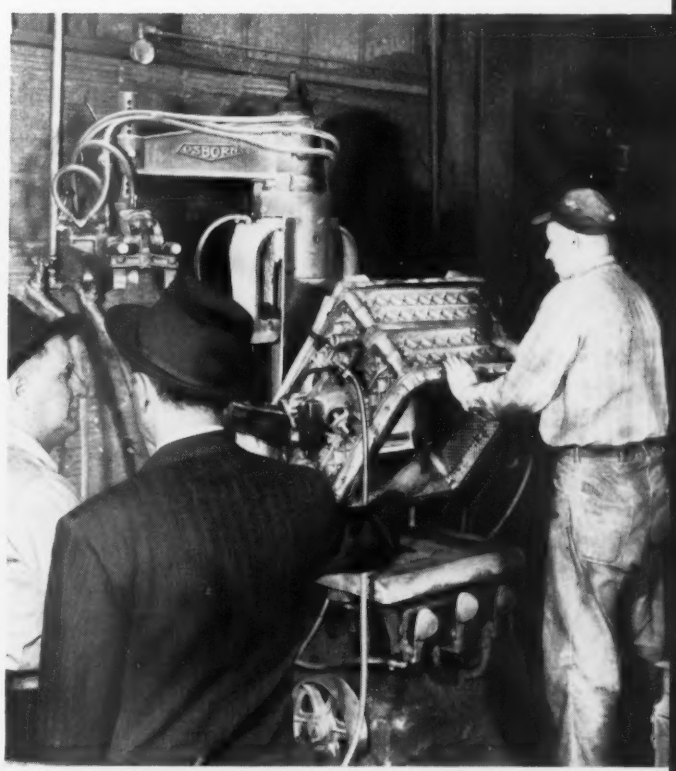
OSBORN'S Rota-Lift reduces heavy manual effort by mechanically helping the molder roll over molds, draw the cope and close the mold in addition to jolting and squeezing.

With large match-plate patterns, one man and one machine can do what formerly took two men on one or two machines . . . at appreciable savings over the former method.

Pick-up arms and cope clamps are adjustable to accommodate a wide range of flask sizes and match-plate patterns. Present match-plate patterns can be used.

Rota-Lift is but one of a complete line of newly developed Osborn machines to improve your production efficiency and cut costs. Ask an Osborn factory trained foundry specialist to look into your needs now. He can demonstrate where money can be saved with mechanized or automatically controlled foundry molding procedures. Call or write

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue *Cleveland 14, Ohio*



No heavy manual lifting here. Rota-Lift mechanically helps the molder roll over the mold, draw the cope and close the mold, besides jolting and squeezing.

SEE THE OSBORN ROTA-LIFT AT THE FOUNDRY SHOW, BOOTH 1115

OSBORN

MOLDING MACHINES **CORE BLOWERS**

Another example of Osborn leadership and advanced engineering

(*Concluded from page* 147)

Cleveland branch metal division. He joined the company at Cleveland in 1942 as a salesman and in 1947 was appointed metal sales manager of the branch.

♦ ♦ ♦

George Shutak has been appointed sales engineer in the Youngstown, O., office, Ramtite Co., Chicago, to handle the company's line of refractories in the Cleveland-Youngstown district.

♦ ♦ ♦

Gary Steven has been named senior metallurgist, Armour Research Foundation, Illinois Institute of Technology, Chicago. A native of Vienna, Mr. Steven was graduated from Massachusetts Institute of Technology and joined the foundation in 1948.

♦ ♦ ♦

Irvin H. Fullmer has been appointed chief of National Bureau of Standards' Engineering Metrology Section, formerly designated the Gage Section. Mr. Fullmer was graduated from Case Institute of Technology and joined the bureau in 1917.

♦ ♦ ♦

Paul L. Arnold, resident manager of the Chattanooga, Tenn., Works, U. S. Pipe & Foundry Co., Burlington, N. J., was recently elected president of the Chattanooga Chapter, Tennessee Society of Professional Engineers.

♦ ♦ ♦

Louis W. Olsen Jr. has been appointed purchasing agent, Grindle Corp., Harvey, Ill., maker of stack gas cleaning and melting equipment. For the past 7 years Mr. Olsen has been engaged in plant layout, production engineering and estimating in the foundry industry.

♦ ♦ ♦

Leonard J. Shorek has joined Fred W. Fuller Co., Cleveland, to handle the company's line of industrial ovens

ROBERT J. JOHNSON
. . . technical research, INCO

in northern Ohio. A graduate of Detroit Institute of Technology, Mr. Shorek for five years was chief engineer, Young Bros. Oven Co., Cleveland.

♦ ♦ ♦

Robert J. Johnson has joined the Pittsburgh Technical Section, Development and Research Division, International Nickel Co., New York. Mr. Johnson was graduated from Pennsylvania State College and until recently was chief metallurgist, Round Chain Co., Cleveland. Previously he was in the metallurgical research laboratory, Republic Steel Corp., Massillon, O.

♦ ♦ ♦

Charles N. Outman, secretary-controller, Hansell-Elcock Co., and **Ian F. Steven,** controller, Hills-McKenna Co., both of Chicago, have been elected to membership in the Controllers Institute of America.

♦ ♦ ♦

Donald L. Price, for 2 years eastern sales manager, Norton Co., Worcester, Mass., has been named sales manager of the Abrasive Division. Mr. Price joined the company in 1920, and in 1926 was sent to the Detroit office, where he became district manager. He returned to Worcester in 1949.

♦ ♦ ♦

Robert A. Ziesing has joined Charles Dreifus Co., Philadelphia, as chief metallurgist to handle sale of melting alloys for the precision investment casting industry. Mr. Ziesing was graduated from Yale University and was formerly assistant metallurgist, Dodge Steel Co., Philadelphia.

♦ ♦ ♦

James R. Ireland, formerly staff assistant to the vice president in charge of research and engineering, Indiana Steel Products Co., Valparaiso, Ind., has been named assistant director of research. **James G. Richmond** has been appointed assistant manager of the manufacturing division.

♦ ♦ ♦

Carl F. Haertel, until recently general foundry superintendent, Falk Corp., Milwaukee, has become divisional works manager of the foundry. **Foster C. Koehn,** plant engineer, has been named director of plant engineering. **Robert H. Weaver** is industrial relations director, and **B. C. Bugbee Jr.,** divisional works manager of machine shops and general service. **Charles Fuerst,** assistant foundry superintendent, has become general foundry superintendent.

♦ ♦ ♦

Byron H. Jacoby has been named representative in the Central States sales district recently established by Frederic B. Stevens Inc., Detroit. With headquarters in Dayton, O., Mr. Jacoby will cover a portion of the southwestern Ohio territory. He was formerly associated with Frigidaire Division, General Motors Corp.

LOUIS W. OLSEN JR.
. . . joins Grindle Corp.

LEONARD J. SHOREK
. . . joins Fred W. Fuller Co.

DONALD L. PRICE
. . . sales mgr., Norton Co.

BYRON H. JACOBY
. . . joins F. B. Stevens

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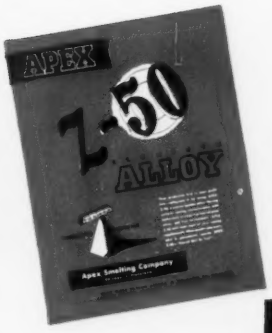
QUALITY AND ECONOMY
tested and proved on the job

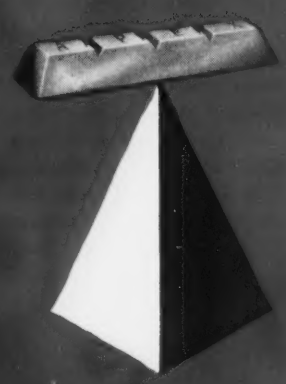
Above average mechanical properties, uniform casting characteristics and free machinability make Z-50 aluminum alloy developed by Apex an outstanding money saver on your production line.

Fulfilling the foundry's need for a quality all-purpose alloy, Apex Z-50 polishes and buffs to a satin finish, has excellent response to anodizing and other chemical and electrochemical finishes. Its as-cast properties are right for most castings, it may be treated for highly stressed castings, and it provides superior dimensional stability with an aging treatment.

Apex Z-50 is another superior product of Apex research and scientifically controlled production, tested and proved in the foundry field and in final application.



Send for your copy of Apex Z-50 folder showing composition, physical properties, and permanent mold and sand cast mechanical properties.



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Combines safety, comfort and economy with the amazing qualities of Neoprene. Neoprene withstands oils, acids and corrosive chemical solutions. Resists heat, sunlight and abrasion without softening or cracking. Resists cutting. Curved finger construction and flannel lining for extra comfort. Also available in other styles and constructions. Color—Black. One size only.

STYLE NO. 1405

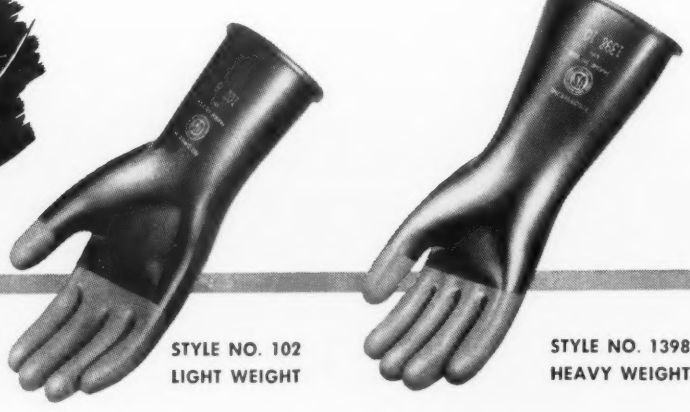
U. S. DURA-GRIP PLASTIC COATED CANVAS

Specially compounded vinyl coating gives these gloves super abrasion-resistant qualities. Curved finger construction, flannel lining for extra comfort. For handling cement blocks, lumber, metal bars and pipes, etc. Color—Yellow. One size only. Also available in other styles for different uses.

STYLE NO. 129

U. S. GRIP-SURE

Made of pure natural rubber latex. Ideal for canning and other light industrial uses. Highly resistant to most fruit and vegetable acids. Tough, yet extremely flexible. Specially designed pattern on fingers and palm for extra gripping qualities. Sizes 7 to 10 including half sizes.



STYLE NO. 102 LIGHT WEIGHT

STYLE NO. 1398 HEAVY WEIGHT

U. S. INDUSTRIAL NEOPRENE UNLINED GLOVES

Made of specially compounded Neoprene to withstand oils, acids and other corrosive chemical solutions. Made with curved fingers. Extra roughened surface for positive grip. Scientifically developed to give utmost in safety, comfort, and economy. Also available in other styles.

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WISCONSIN REGIONAL CONFERENCE

Considers Noise and Other Foundry Problems

By EDWIN BREMER
Metallurgical Editor
and ERLE F. ROSS
Chicago Editor

WISCONSIN Chapter of AFS in co-operation with the University of Wisconsin chalked up another successful regional foundry conference at Milwaukee, Feb. 11-12. Over 620 attended 21 technical sessions, two luncheons and a banquet at the Hotel Schroeder.

At the first luncheon, with R. V. Osborne, Lakeside Malleable Castings Co., Racine, Wis., presiding, Hans J. Heine, AFS, Chicago, urged those present to develop their ability to do intelligent thinking by keeping an open mind and using their reasoning powers. Present tendency appears toward acceptance of the written and spoken word of others without question.

At the banquet, with A. F. Pfeiffer, Allis-Chalmers Mfg. Co., West Allis, Wis., presiding, David P. Livingstone, Washington, Iowa, indicated that farmers are in excellent financial condition and in the spring will establish a good demand for agricultural equipment. John F. Schnur, Armour Research Foundation, Chicago, spoke at the second luncheon. P. C. Fuerst, Falk Corp., Milwaukee, was chairman. Mr. Schnur discussed foundry conditions and practices in India, stating that methods are primitive. Even the smallest castings are bedded in the floor, using a cope. Suitable sands are hard to find; common foundry hand tools are a rarity, and most foundry supplies such as clay, bentonite, seacoal, etc., have to be processed by individual foundries.

Those in attendance were welcomed at the opening session by A. F. Pfeiffer, president of the Wisconsin chapter. Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., and national president of AFS, spoke on the various activities of the society. Prof. George Barker, University of Wisconsin, Madison, Wis., introduced Dean Kurt F. Wendt of the College of Engineering who pointed out that advancement in industry is dependent upon freedom, courage, confidence, and optimism. Education, research and increased productivity are keys for advancement.

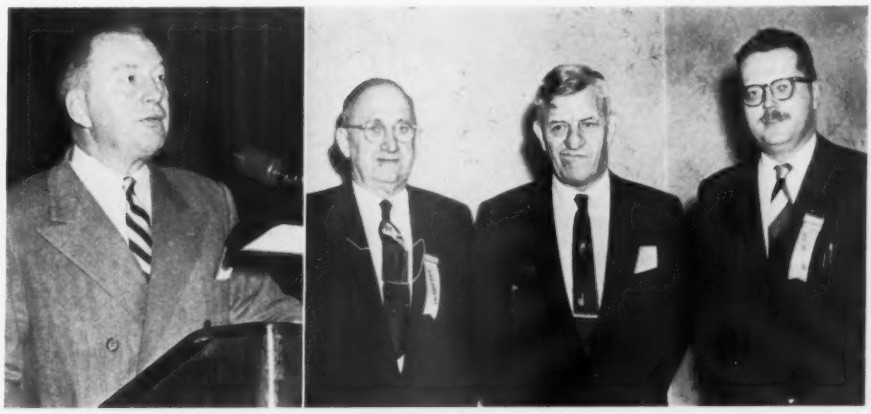
First technical session under the direction of Mr. Pfeiffer dealt with "Combating Effects of Noise" with Walter F. Scholtz, Allis-Chalmers Mfg. Co., as speaker. Mr. Scholtz's paper is presented on page 112 of this issue.

Steel Sessions—Major problem in producing sound steel castings, according to B. C. Yearley, National Malleable & Steel Castings Co., Cleveland, is putting heat into metal and then taking it out. He stated that research by the Naval Research Laboratory and the Steel Founders' Society of America, provided data for developing satisfactory methods of feeding castings. In considering a number of examples, he stated that a cored bushing should be fed as though it were solid unless the core radius is equal to four times the metal thickness.

He described a method for determining the size of a circular feeder. Using a 4 x 4 x 12-in. bar as the casting which is to be fed with selection of a 4-in. diam riser as the nearest approach to proper size, the procedure is to ascertain the volume shrinkage of the bar at 5 per cent or 9.6 cu in. The latter is multiplied by a safety factor of 160 per cent giving 15.36 cu in. That result is divided by the riser height (1½ D) or 6 in. which gives a cross sectional area of 2.56 sq in. or 1 13/16 in. in diam. That value is added to the 4-in. diam of proposed riser, resulting in a riser of 5 13/16 in. in diam to be applied to the 4 x 4 x 12-in. bar. E. Tetzlaff, Pelton Steel Castings Co., Milwaukee, and David C. Zuege, Sivyer Steel Castings Co., Milwaukee, presided at the first steel session.

Speaking on "Modernization of the Foundry," Glenn W. Merrefield, Giffels & Vallet Inc., Detroit, indicated that the first step in such a program is an analysis and survey of each plant department from yard handling through finishing and shipping. Anthony Herrmann, Belle City Malleable Iron Co., Racine, was chairman and John McBroom, Stainless Steel Foundry & Engineering Co., Milwaukee, co-chairman. A projected layout should be made of rearranged existing facilities and new facilities needed, according to Mr. Merrefield. Major expenditures for changes and equipment should be self-amortizing in labor savings over a period of not more than 3 years' operation. The project must be tailored to suit local conditions, with allowance for sufficient flexibility to operate under varying work loads.

Mr. Merrefield's discussion was concerned chiefly with modernization of the steel foundry. He considered the different departments, and suggested factors which should be given study. A trend toward electric melting, the need for conveying equipment, importance of adequate sand mixing capacity and sand control equipment, and the necessity of considering the growing requirements for cored castings are among the subjects discussed. In conclusion, the speaker stressed the need of



Collins L. Carter, left, Albion Malleable Iron Co., Albion, Mich., president of the AFS, made the first welcoming address to the general meeting. Left to right, right view, are A. F. Pfeiffer, Allis-Chalmers Mfg. Co., conference and Wisconsin Chapter president; John F. Schnur, International Dept., Armour Research Foundation, who was Friday luncheon speaker; and R. V. Osborne, Lakeside Malleable Castings Co., conference chairman and chapter vice president

maintaining an open, inquiring mind in developing a modernization plan, and that the various processes and machinery will follow with the adoption of sound basic ideas.

Housekeeping in the foundry was the topic of the third steel session, with Erich M. Sobota, Wisconsin Electric Power Co., Milwaukee, and D. S. Bosma, Bucyrus-Erie Co., South Milwaukee, as chairmen. The speaker, C. G. Lauckner, General Electric Co., Schenectady, N. Y., stated that captive foundries which do not rank in the top 25 per cent on appearance and good housekeeping are not in the condition the parent firm should expect. If a non-captive foundry is not in that same category, it is not making as great a net profit as might appear. While it is easy to clean up a foundry, considerably more study and money are required to place the foundry in the top bracket on appearance. Many foundry operators fail to apply their knowledge to improve appearance. Since foundries are in competition with other industries for employees, it is necessary that they do the best housekeeping job.

"Casting Quality as Related to the pH Value of Molding Sand" was the subject of a contribution prepared by V. E. Zang and G. J. Grott, Unitcast Corp., Toledo, O., and presented by the latter. Bradley H. Booth, Carpenter Bros., Milwaukee, presided, and V. E. Ziemer, Maynard Electric Steel Casting Co., Milwaukee, was co-chairman.

As the preface, the speaker mentioned that foundrymen have long been plagued with variations in casting quality due to cyclical changes in the molding sand, these changes occurring with no apparent change in practice and seldom having been pinned down by conventional laboratory tests.

Recent experience in numerous foundries has shown that chemical content of sand mixtures is a prime factor in sand control, this being true regardless of type of clay used. Clays are colloidal materials and are highly sensitive to chemicals. Mr. Grott stated that pH measurements have proved reliable where the type of chemical added is known. Most experience has been gained where soda ash was used. It was pointed out, however, that pH control is not a cure-all for sand as nothing can fully compensate for poor heading and gating practice, a poor grain size distribution, or other loose practice. According to Mr. Grott, however, a year's experience has proved that with pH control of a good sand mixture, defects due to sand failure become a negligible factor in the production of steel castings.

Gray Iron Sessions — First gray iron session featured a presentation by W. A. Sokolosky, Plastics Division, Monsanto Chemical Co., Springfield, Mass., on use of synthetic resins in the foundry. R. M. Stair, General Malleable Corp., Waukesha, Wis., was chairman and Frank Kulka, Motor Castings Co., West Allis, Wis., co-chairman. The speaker covered shell molding, resin-bonded cores, polyelectrolytes in molding sand and melamine resins in plaster mold practice. Mr. Sokolosky pointed out that although coated sands reduce the amount of resin required for equivalent shell strengths, heat transfer through a shell mold increases with decreased resin content.

In the second session on gray iron, with H. W. Schwengel, Modern Equipment Co., Port Washington, Wis., and T. H. Tanner, Zenith Foundry Co., West Allis, Wis., presiding, Sam F. Carter, American Cast Iron Pipe Co., Birmingham, discussed the effect of some variables in cupola operations and stated that the sulphur and carbon pickups and silicon loss are closely related to fuel composition and air regulation. Sulphur of course depends upon S content in the coke, and amount of carbon pickup is related to ash content—the higher the ash the lower the carbon. However, high-sulphur irons will not pick up as much carbon, even with lower ash coke.

Best melting temperature and greatest carbon pickup are obtained with suitable coke when its size is 8 to 15 per cent of the cupola diameter. Coke should be handled carefully to avoid breakage. Airblast should be adjusted properly, and use of thin-section steel scrap avoided if possible.

Theodore Redin, Wm. Demmler & Bros., Kewanee, Ill., addressing the third gray iron session with E. C. Wussow, Kaukauna Machine Co., Kaukauna, Wis., presiding, gave a resume of the development of core-blowing machines from the early prototype to date. Air is a carrier

(*Please turn to page* 251)

Left to right are: Ray Witschey, A. P. Green Fire Brick Co., Chicago; Hiram Brown, Solar Aircraft Co., Des Moines, Iowa; and Dean Kurt F. Wendt and Prof. George Barker, University of Wisconsin. Mr. Witschey addressed the malleable representatives; Mr. Brown was a panelist in the nonferrous group's forum; Dean Wendt made a welcoming address; and Prof. Barker was conference associate chairman

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And iron deoxidized with FERROCARBO® patented Briquettes *is more fluid* at casting temperatures than untreated iron. You can prove this in a ten day test in your cupola. Longer runs are evident from the first day you add FERROCARBO to the charge. After eight to ten days, when the sprues and returns are saturated, the spiral fluidity molds will show ***considerably longer*** runs.

Another advantage is a substantial reduction in misruns—especially in castings with complicated molds and thin sections. You will get increased silicon recovery, too; and you can charge more scrap—steel or cast iron—because FERROCARBO reduces the chilling tendency.

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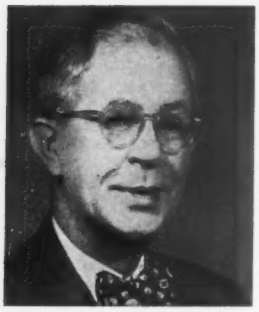
REGISTERED TRADE MARK

84-43



Man-to-Man

By RALPH L. LEE

Filosofy in the Foundry

"Some day we'll have to write a book or something which will show that almost every law of physics has its equivalent in humanics"

ATTENDED a foundry meeting the other night without having to make a speech, and I must say that I enjoyed every minute of the novelty. The subject, "Casting Defects," was quite interesting, along with the harangue that was developed by the vocal members of the group. But probably the thing I got the biggest bang out of (and I blush as I mention it) was having any number of foundry folks recognize and greet me as the guy who concocts the Man-to-Man column in FOUNDRY.

No matter how much a fellow insists on being of the shrinking violet type, having foundry people come up to h'm and howdy him as though he were one of the craft and the gang is a privilege not to be sneezed at, particularly by an amateur.

For a moment, the other night, though, the edge was sort of taken off this inner gloating when three separate greeters spoke of the way I sandwich in quite a hunk of philosophy between thin slabs of foundry shop talk. Now, without knowing exactly why, I find myself bristling up a bit when some one accuses me of being a philosopher, and it's all I can do to keep from blurting out, "Smile when you call me that, Son!"

When I got home from the meeting the other night, I looked the word up in the dictionary, as late as it was, for I had had the feeling that to most people a philosopher is sort of a lazy highbrow who sits on his fanny making smart cracks about busy people who were doing things he couldn't do to save h's neck.

While Heaven only knows that plenty of kibitzing and smart cracking goes on in even the best-run foundries, philosophy and philosophers seemed to be clear out of bounds. So that's why, I guess, I wasn't too keen on being branded with these terms.

"But on the other hand," I said to myself, "here we have college graduates who, after all the schooling they've been through, work their mental and academic fingernails to the bone, so to speak, to earn one of these doctor of philosophy degrees." So I reasoned that being called a philosopher couldn't be all bad.

"In fact," I went on in this one-man huddle, "some of the most respected authorities in foundry practice and research I have learned to know had earned the right to be called Doctors of Philosophy, although now that I think of it none of them ever brought the subject up and seemed to feel uncomfortable when someone else did."

So, as I say, I looked the word up, and here's what the dictionary said: "Philosophy: The science which investigates the facts and principles of reality and of human nature and conduct."

Until I looked this word up, I used to wonder how a chemist, a poet, a physician, an astronomer, an engineer and, yes, a real topnotch student of foundry affairs could all be dubbed with the same title. But with the dictionary in front of me, the mystery began to clear up.

PHILOSOPHY is the science which investigates the *facts* and *principles* of anything that is real, whether it be the behavior of dancing atoms in a white hot ladle of molten iron or the bellyaching of a bunch of disgruntled foundrymen. The bellyache is just as real as the temperature of the iron and just as important, and both are governed by facts and principles which can be recognized and studied.

Rest assured that I am not trying to fill up space or to make a mountain out of a molehill, but I now am convinced that it might well be that failure to recognize the facts and principles underlying human nature and conduct as being just as real and just as important to the success of a foundry operation as the facts and principles governing the nature of the things and forces we use is at the bottom of much of our people trouble in the foundry.

There can be no question that in the past we have gotten into the habit of arbitrarily setting up a list of items we consider to be legitimate parts of business and of excluding others (frequently more important). Maybe it's because there are so many more people than cupolas, sand mixers, molding machines, conveyors and stuff. They're commoner, and if one batch won't do, let's try another; there are plenty where they came from. We haven't time to alloy the human scrap we get.

Or if it isn't that, maybe we have kidded ourselves into thinking that human failure is always due to the deliberate will of the individual involved—that he could do what he should do if he really wanted to, whereas iron has its never failing melting point, coke its Btu's, clay its adhesiveness and sand its refractoriness; all according to Hoyle, down in the book according to charts and curves, measureable, figurable and predictable (we hope).

We all know better than this, of course. We know, or at least have a hunch, that there is always just as much a reason for what any person does as there is for what any melt does—the only thing being that with an unlimited supply of people we haven't felt the need to develop the science which investigates the facts and principles of human nature and conduct along with those of the other realities we deal in.

Boss Kettering, that lovable philosopher and research genius of General Motors, has been saying all the years I have known him (over 45) that the characteristics of human

(*Concluded on page* 201)

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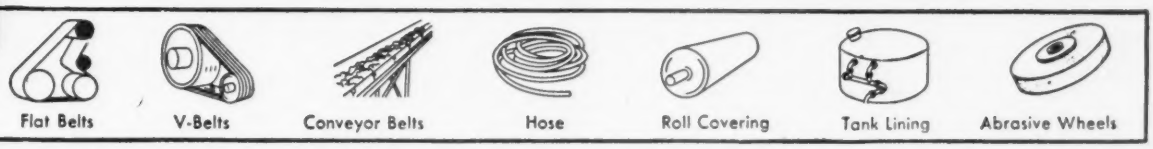

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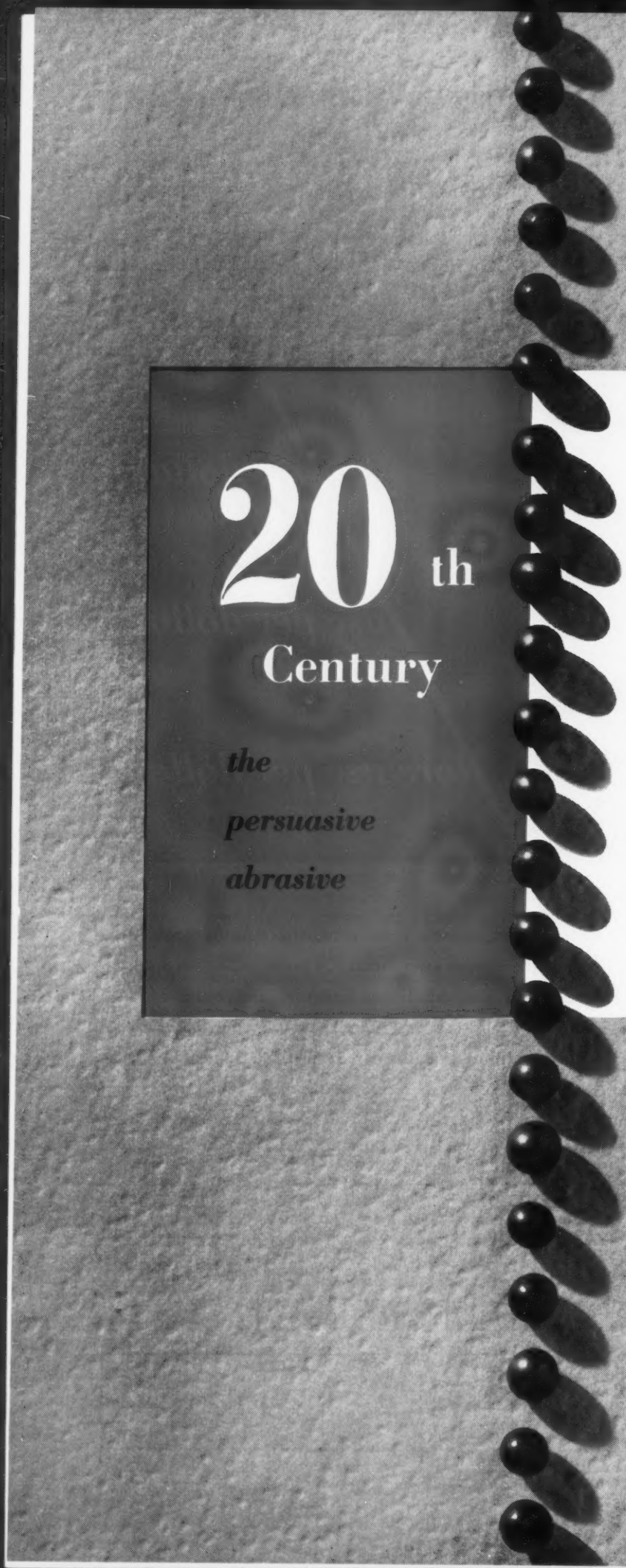

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Foundry Statistics

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1951	1,085,241	656,076	.....
1952			
Dec.	80,680	50,485	173,494
Total	926,120	573,472	.....
1953			
Jan.	87,249	53,272	174,809
Feb.	86,515	51,963	175,088
Mar.	94,481	57,025	177,776
Apr.	95,923	57,757	174,514
May	82,050	48,011	160,387
June	86,514	50,819	151,016
July	77,111	45,413	137,251
Aug.	73,855	45,415	120,801
Sept.	74,333	45,466	114,523
Oct.	73,473	45,515	104,046
Nov.	63,435	37,500	93,156
Dec.	72,126	39,657	95,612
Total	967,065	577,813	.....

Copper-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1951	1,197,443	1,075,437	69,883	.....
1952[3]				
Dec.	90,799	81,777	5,715	76,871
Total	1,009,910	910,862	63,865	.....
1953[3]				
Jan.	85,781	76,686	5,388	80,793
Feb.	85,183	76,847	5,061	76,578
Mar.	92,798	83,639	5,716	69,490
Apr.	94,362	85,471	5,462	72,291
May	85,223	76,912	4,855	66,926
June	84,656	76,333	4,706	64,535
July	71,041	64,451	3,926	61,209
Aug.	78,357	70,557	4,890	63,419
Sept.	80,307	71,895	5,273	59,141
Oct.	83,661	74,221	5,775	53,867
Nov.	74,712	66,300	5,077	49,481
Dec.	77,669	68,814	5,082	47,922
Total	993,750	892,126	61,211	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1951	515,131	193,378	160,011	151,465	.....
1952[3]					
Dec.	53,343	17,277	16,191	19,608	146,499
Total	518,979	194,616	146,883	169,732	.....
1953[3]					
Jan.	55,629	19,158	16,147	20,052	142,542
Feb.	54,864	17,583	16,698	20,272	148,557
Mar.	57,423	18,989	14,765	23,255	145,749
Apr.	61,582	20,009	18,583	22,620	141,231
May	57,602	19,600	16,479	21,208	138,037
June	56,820	19,330	15,535	21,675	136,437
July	51,653	16,664	15,733	18,915	126,426
Aug.	50,900	16,007	16,294	18,200	127,896
Sept.	53,694	17,818	17,215	18,245	122,049
Oct.	55,438	17,212	16,988	20,893	116,744
Nov.	51,405	16,209	15,349	19,409	108,698
Dec.	52,025	15,375	16,582	19,363	107,754
Total	661,035	213,954	199,463	243,107	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1951	30,825	28,090	.....
1952[3]			
Dec.	3,110	2,872	16,020
Total	34,857	32,977	.....
1953[3]			
Jan.	3,073	2,825	15,680
Feb.	3,225	3,033	14,834
Mar.	3,362	3,093	13,608
Apr.	3,294	3,046	12,709
May	2,679	2,434	13,635
June	3,136	2,666	13,664
July	2,372	2,084	13,840
Aug.	2,559	2,279	13,125
Sept.	2,524	2,236	12,454
Oct.	3,015	2,708	11,477
Nov.	2,677	2,413	10,619
Dec.	2,685	2,427	9,324
Total	34,601	31,244	.....

Foundry Production Workers

Estimated Number

(Thousands)

	Dec. 1953	Nov. 1953	Dec. 1952
Ferrous	195,700	196,900	226,300
Nonferrous	72,800	74,400	82,300

Average Weekly Earnings

Gray Iron	$74.03	$73.47	$73.40
Malleable Iron	72.77	71.63	76.61
Steel	79.20	76.24	82.76
Nonferrous	81.41	79.20	84.02

Average Weekly Hours

Gray Iron	39.8	39.5	41.1
Malleable Iron	38.5	37.9	41.3
Steel	39.6	38.7	42.4
Nonferrous	40.5	39.6	43.0

Labor Turnover Rate (Dec.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	2.3	4.8	0.8	3.6
Malleable Iron	1.7	5.1	1.2	3.6
Steel	1.8	4.4	0.6	3.4
Nonferrous	2.5	7.3	1.1	5.6

Source: Bureau of Labor Statistics

Gray Iron Castings—Shipments

(net tons[1])

	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[3]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[4]	Total[4]	
1951	14,988,555	8,453,046	9,573,347	4,471,539	2,614,517	1,257,542	639,996	1,473,192	687,503	.....
1952										
Dec.	1,143,715	621,127	715,389	323,996	247,605	116,410	42,957	95,198	42,566	1,316,308
Total	12,862,494	7,373,757	8,095,299	3,794,164	2,238,309	1,070,252	544,896	1,312,518	651,472	.....
1953										
Jan.	1,161,945	622,392	730,216	324,330	252,181	118,514	38,385	93,930	47,233	1,333,255
Feb.	1,135,868	607,160	721,847	315,101	228,360	106,398	44,420	93,152	48,089	1,332,038
Mar.	1,264,271	674,720	800,390	341,656	250,447	119,630	41,414	114,885	57,135	1,375,886
Apr.	1,277,288	683,047	799,872	329,802	246,873	122,702	44,877	120,105	65,561	1,305,849
May	1,185,545	641,581	734,326	312,836	238,202	115,728	41,373	113,136	58,508	1,271,711
June	1,196,106	648,400	743,737	312,681	232,596	115,946	45,542	114,118	60,113	1,245,904
July	1,056,422	573,280	652,371	274,890	212,187	106,526	36,715	97,739	57,410	1,232,651
Aug.	1,069,392	588,543	646,902	286,449	217,930	107,428	40,327	107,805	56,428	1,222,612
Sept.	1,105,582	611,905	669,225	289,909	232,055	117,694	37,055	108,270	58,977	1,170,191
Oct.	1,141,526	650,229	669,757	300,249	245,966	124,177	41,917	118,306	65,580	1,075,538
Nov.	1,004,326	563,930	589,657	266,039	227,800	111,022	31,373	101,576	53,920	977,012
Dec.	1,032,444	552,565	634,250	274,203	228,532	108,700	30,051	94,053	45,558	954,885
Total	13,630,715	7,417,752	8,392,550	3,537,645	2,813,129	1,374,465	473,449	1,277,075	674,512	.....

Steel Castings—Shipments

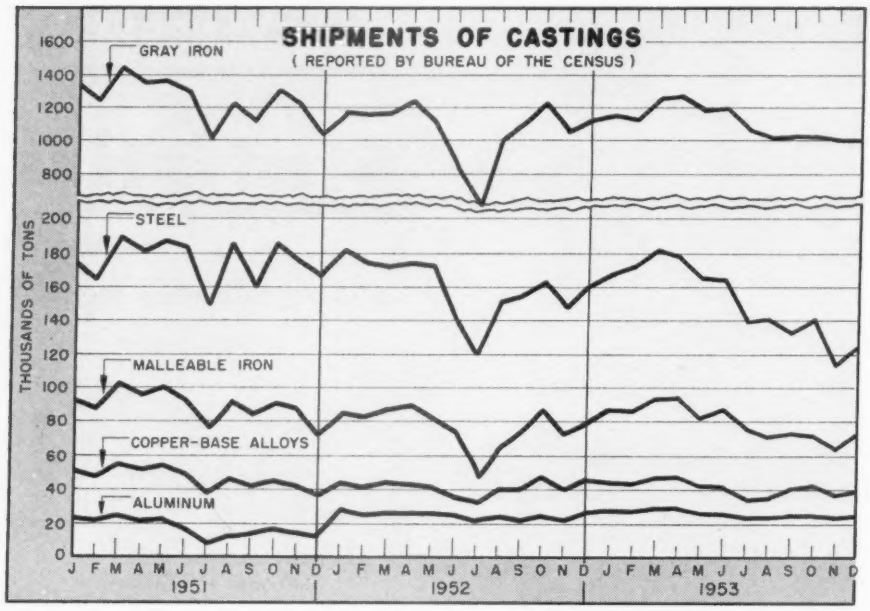
(Net tons[1])

	All Castings			Carbon Steel			Alloy Steel			Unfilled Orders[3]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1951	2,050,054	1,506,903	466,172	1,541,280	1,162,687	415,915	508,574	344,216	50,157	.....
1952										
Dec.	162,237	122,670	26,728	113,956	85,975	24,046	48,281	37,451	2,682	719,203
Total	1,925,707	1,476,746	342,561	1,496,450	1,053,264	298,948	553,403	430,493	40,613	.....
1953										
Jan.	167,211	126,819	27,150	118,423	118,423	24,788	48,788	38,121	2,362	706,490
Feb.	175,675	137,592	33,156	122,624	94,991	29,828	53,051	43,495	3,328	644,302
Mar.	182,181	141,873	34,364	129,055	100,069	31,772	53,126	42,286	2,592	634,600
Apr.	179,615	140,051	34,035	128,457	99,602	31,212	51,158	40,938	2,823	573,565
May	165,649	126,380	29,552	117,318	88,781	26,888	48,331	38,036	2,664	328,931
June	164,665	125,984	30,381	116,358	88,260	27,767	48,307	38,130	2,614	475,756
July	139,577	105,687	22,925	95,891	71,488	20,938	43,686	34,532	1,987	467,900
Aug.	141,340	107,941	25,026	97,076	73,784	22,637	44,264	35,003	2,389	418,927
Sept.	135,303	102,880	24,108	95,944	72,780	21,724	39,359	30,338	2,384	327,172
Oct.	140,702	106,788	25,354	100,568	76,118	23,449	40,134	30,988	1,905	313,684
Nov.	114,088	84,945	17,784	79,989	57,947	16,233	34,099	27,167	1,551	308,526
Dec.	123,281	91,017	18,685	86,465	62,377	16,998	36,674	29,810	1,687	278,389
Total	1,829,287	1,397,957	322,520	1,288,168	1,004,620	294,234	540,977	428,844	28,286	.....

[1] Source: Bureau of Census. [2] For sale only. [3] Based on new sampling method; not comparable to prior figures.
[4] All cast iron pipe is shipped for sale.

(Concluded on page 160)

FOUNDRY STATISTICS (Concluded from Page 159)



Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1953	1954
Jan.	99.6	175.8
Feb.	97.5	.....
Mar.	132.2	.....
Apr.	111.8	.....
May	182.1	.....
June	156.4	.....
July	158.9	.....
Aug.	235.5	.....
Sept.	127.7	.....
Oct.	87.1	.....
Nov.	149.4	.....
Dec.	160.8	.....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent (monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1951	79,133,744	78,868,124	3,664,404
1952			
Dec.	6,723,100	6,981,036	246,107
Total	68,254,109	67,865,639	3,102,446
1953			
Jan.	6,763,494	6,880,195	248,945
Feb.	6,140,075	6,271,311	237,620
Mar.	6,842,488	6,880,579	275,442
Apr.	6,543,601	6,541,307	271,955
May	6,824,810	6,752,823	272,673
June	6,625,223	6,692,864	254,830
July	6,748,229	6,654,080	217,504
Aug.	6,719,941	6,587,005	236,738
Sept.	6,404,143	6,330,441	236,119
Oct.	6,554,638	6,555,613	236,329
Nov.	6,208,155	6,039,813	216,837
Dec.	6,093,009	6,041,383	210,388
Total	78,467,806	78,227,414	2,915,420

Ingot Brass & Bronze

(Shipments in net tons)

	1953	1954
Jan.	24,423	20,661
Feb.	25,429	.....
Mar.	28,256	.....
Apr.	25,044	.....
May	21,660	.....
June	20,818	.....
July	19,321	.....
Aug.	20,156	.....
Sept.	21,463	.....
Oct.	22,280	.....
Nov.	21,860	.....
Dec.	20,541	.....
Total for year	271,251	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Totals	Shipments—For Sale	Unfilled Orders[2]
1951	478,996	324,964	.....
1952[3]			
Dec.	42,148	29,309	85,767
Total	408,353	282,673	.....
1953[3]			
June	49,051	31,255	88,060
July	39,360	25,221	83,034
Aug.	38,214	24,230	77,895
Sept.	38,965	26,403	72,631
Oct.	41,170	28,729	72,967
Nov.	38,032	26,461	69,218
Dec.	38,976	27,664	64,047
Total	523,892	341,963	.....

Pig Iron Production and Consumption

	Production** (Standard grades—1000 net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace, 1000 gross tons) Total	Cupola	Air	Electric
1951	70,264.5	3,186.2	3,169.0	55,134.1	8,774.8	63,760	5,731	354	136
1952									
Dec.	6,414.7	293.4	315.1	5,106.9	699.2	5,685	419	24	14
Total	61,306.8	2,864.2	3,013.3	48,254.0	7,174.9	54,911	4,909	269	113
1953									
Jan.	6,470.6	274.9	285.5	5,201.5	708.8	5,784	425	24	12
Feb.	5,802.6	187.0	294.6	4,640.7	680.3	5,027	418	24	14
Mar.	6,601.1	263.9	358.1	5,256.1	723.0	5,873	466	27	14
Apr.	6,161.6	244.7	327.1	4,885.6	704.2	5,568	478	28	12
May	6,508.5	210.0	347.7	5,237.0	713.8	5,844	436	24	14
June	6,288.0	201.6	313.4	5,075.0	698.0	5,581	437	24	12
July	6,425.9	213.5	344.4	5,145.1	722.9	5,580	367	20	15
Aug.	6,381.1	202.1	310.7	5,167.1	701.2	5,672	385	21	14
Sept.	6,121.4	209.4	310.4	4,927.0	674.5	5,379	393	22	16
Oct.	6,409.2	218.9	290.8	5,175.1	724.5	5,733	395	21	13
Nov.	5,995.5	201.0	277.2	4,859.3	658.0	5,325	343	18	16
Dec.	5,713.0	172.3	276.4	4,625.5	638.7	.....	.....	.....	.....
Total	74,878.5	2,599.3	3,736.3	60,195.0	8,347.9	.....	.....	.....	.....

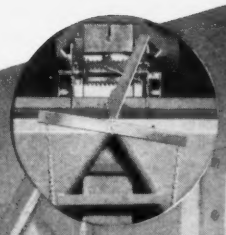
Iron and Steel Scrap Consumption

(Gross tons*)

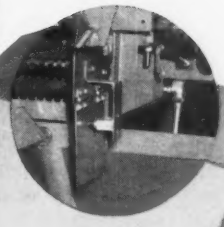
	All Scrap—Total	All Scrap—Purchased	By Types of Furnace: Cupola—Total	Cupola—Purchased	Air—Total	Air—Purchased	Electric—Total	Electric—Purchased
1951	68,518,208	33,822,431	11,090,607	5,878,939	1,203,740	441,099	8,391,919	5,389,005
1952								
Nov.	5,960,435	2,885,008	731,825	379,950	80,228	30,502	780,042	518,320
11 mo.	55,535,827	27,547,313	8,259,871	4,350,320	960,612	360,525	7,256,219	4,699,749
Dec.	6,089,722	2,973,633	804,275	412,177	92,621	35,064	758,845	491,084
Total	61,625,549	30,520,946	9,154,146	4,752,497	1,053,233	395,591	8,015,064	5,190,833
1953								
Jan.	6,256,718	3,061,551	810,254	413,971	95,430	35,695	795,292	517,963
Feb.	5,802,854	2,817,896	818,375	422,306	92,371	35,234	745,179	478,486
Mar.	6,536,867	3,211,476	901,786	464,110	103,034	38,583	857,760	563,489
Apr.	6,227,089	3,026,533	921,589	474,185	106,449	41,004	820,647	531,509
May	6,294,920	3,105,598	861,404	450,477	92,703	35,566	798,098	523,606
June	5,951,170	2,835,875	876,320	454,905	99,799	38,934	743,530	468,129
July	5,539,468	2,597,365	729,114	369,283	74,815	26,755	691,521	443,263
Aug.	5,637,759	2,614,153	753,272	390,741	77,047	28,167	678,968	428,332
Sept.	5,395,721	2,393,773	782,131	405,274	80,866	29,032	595,523	363,706
Oct.	5,628,568	.....	779,444	.....	75,618	.....	566,878	.....
Nov.	5,064,565	.....	687,498	.....	60,200	.....	477,666	.....
11 mo.	64,315,699	.....	8,921,187	.....	958,332	.....	7,821,062	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Based on new sampling method; not comparable to prior figures.

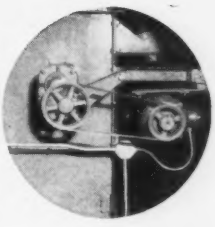
Sand Diverter
In Twin Hopper installations, an adjustable diverter proportions the amount of sand going into each hopper to compensate for unequal requirements.



Automatic Shutoff
The molder just starts the machine and forgets it. When the hoppers are full and sand reaches a predetermined level, the Handy Sandy shuts off automatically.

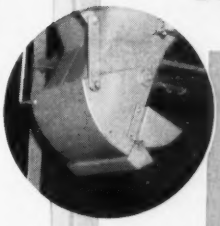


Automatic Elevator Head Takeup
The Automatic Takeup maintains perfect shaft alignment, constant elevator belt or chain tension, and positive V-Belt drive tension at all times, without operator's attention. The entire Takeup mechanism is controlled by a diaphragm type air cylinder through an automatic pressure regulating valve.



HANDY SANDY USERS CONTINUE TO GROW

WITH NEW and REPEAT ORDERS over 1,000 now in use



Dribble Gate
A new development in overhead hopper gates that eliminates any particles of sand from dropping into prepared mold.

HANDY SANDY'S cost-cutting performance *makes repeat users* of hundreds of foundries — like those listed here. Waste motions add nothing to the quality of your castings. Handy Sandy eliminates waste motions and gives you the savings.

1. PUTS SAND PILE OVERHEAD, available to molder who just pulls release. Sand falls into the flask.

2. ELIMINATES SHOVELING, WASTE MOTIONS FOR MOLDER. He spends more time making molds, less time getting ready.

3. INCREASES MOLDERS' OUTPUT. Users find output of molders is increased from 30% to 70%.

4. SAVINGS FROM THE FIRST UNIT PAY FOR THE NEXT. No major investment for the Handy Sandy. Equip one floor at a time. Savings from one unit helps pay for additional units.

5. IMPROVES CONDITION OF SAND. Built-in aerator gives the sand added blending, breaks up lumps, improves texture. Hand riddling often eliminated.

6. TAKES LITTLE SPACE. Occupies no more floor space than sand pile. Requires little headroom, no structural changes required.

7. LOW COST — SIMPLE TO INSTALL. Compact, packaged unit installed in a few hours. *No expensive overhead conveyors, no pits or foundations.* Simplified design means low operating costs, dependable performance.

ALGOMA STEEL CORPORATION, LTD.
Sault Ste. Marie, Ontario

ALUMINUM COMPANY OF AMERICA
Massena, New York

ANDERSON BRASS WORKS, INC.
Birmingham, Alabama

ATTWOOD BRASS WORKS
Grand Rapids, Michigan

BRIDGEPORT BRASS CO.
Exeter, New Hampshire

BUILDERS IRON FOUNDRY
Providence, Rhode Island

CHICAGO HARDWARE FOUNDRY CO.
Chicago, Illinois

ELECTRIC MATERIAL CO.
North East, Pennsylvania

ELKHART BRASS MFG. CO., INC.
Elkhart, Indiana

EMPIRE PATTERN & FOUNDRY CO.
Tulsa, Oklahoma

ERTEL MFG. CORP.
Indianapolis, Indiana

FOOD MACHINERY & CHEMICAL CORP.
Lakeland, Fla. — Los Angeles, Calif.

GOLDENS' FOUNDRY & MACH. CO.
Columbus, Georgia

HAMILTON BRASS & ALUM. CSTG. CO.
Hamilton, Ohio

HOOD RUBBER CO.
Watertown, Massachusetts

KEEN FOUNDRY CO.
Griffith, Indiana

KENOSHA BRASS & ALUM. FOUNDRY
Kenosha, Wisconsin

KINGWELL BROS., LTD.
San Francisco, California

LAYNE & BOWLER CORP.
Montebello, California

H. C. MACAULAY FOUNDRY CO.
Berkeley, Calif.

MAGNUS METAL DIVISION
Chicago, Illinois

MFRS'. IRON FOUNDRY, INC.
Bridgeport, Connecticut

MICHIGAN WHEEL COMPANY
Grand Rapids, Michigan

THE F. E. MYERS & BROS., CO.
Ashland, Ohio

NATIONAL ALUMINUM & BRASS
Independence, Missouri

NELSON FOUNDRY COMPANY
Morton Grove, Illinois

ONTARIO MALL. IRON CO., LTD.
Oshawa, Ontario

OTACO, LTD.
Orillia, Ontario

THE PEERLESS FOUNDRY COMPANY
Cincinnati, Ohio

PONTIAC FOUNDRY CO., INC.
Fort Wayne, Indiana

C. & G. POTTS & CO.
Indianapolis, Indiana

RED JACKET MFG. CO.
Davenport, Iowa

RICHMOND FOUNDRY & MFG. CO.
Richmond, Virginia

SEALED POWER CORPORATION
Muskegon, Michigan

STANDARD BRASS & MFG. CO.
Port Arthur, Texas

UNITED STATES FOUNDRY CORP.
Milwaukee, Wisconsin

UNIVERSAL BRASS MFG. CO.
Los Angeles, California

THE VOLLRATH CO.
Sheboygan, Wisconsin

WELLS MANUFACTURING CO.
Chicago, Illinois

WESTINGHOUSE ELECTRIC CORP.
Attica, New York

WEBER-KNAPP CO.
Jamestown, New York

J. A. WEAVER CO.
St. Louis, Missouri

Space permits only a partial listing of repeat users.

A copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire or phone today.

NEWAYGO engineering company
Newaygo, Michigan

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

Industry Briefs

RUSSELL Pipe & Foundry Co., Alexander City, Ala., began operations at one-third capacity on Feb. 15 in a new, modern $1 million plant exactly nine months after fire razed its former plant May 15, 1953. Full operations with 450 workers will be attained in 12 months, it is hoped. Annual capacity now is 20,000 tons of finished cast pipe and fittings.

* * *

F. F. Shortsleeve Co., 603 Winsor Ave., Elmira, N. Y., a foundry supply company, has been incorporated, listing capital stock of 200 shares, no par value. Burke & Burke, 315 Lake St., Elmira, filed the papers. Directors are Marie O'Donnell, Frederick Shortsleeve, and James Burke. All reside in Elmira.

* * *

Western Mineral Products Co., 1720 Madison St., N.E., Minneapolis, plans to begin construction immediately of a new two-story plant for processing perlite and vermiculite products. The addition will include modern processing equipment, raw material storage bins, and railroad facilities.

* * *

Dravo Corp., 1203 Dravo Bldg., Pittsburgh 22, has moved its Atlanta, office, under supervision of William W. Timmis Jr., to Room 361, 1401 Peachtree St. N.E. Wheeler M. Bearden, formerly of the Pittsburgh office, will join the Atlanta staff at the new address.

* * *

Metallizing Engineering Co., 38-14 30 St., Long Island City, N. Y., is constructing a new plant at Westbury, Long Island. The new building is scheduled for completion July 31, and will occupy 65,000 sq ft of a 7-acre tract. It will include over 20,000 sq ft of office space in addition to 45,000 sq ft of manufacturing, storage and shipping areas, all located on a single floor.

* * *

Frederic B. Stevens Inc., Detroit, has opened two new district sales offices. The Indianapolis office will handle supply sales activities in Indiana, Ohio, Kentucky, Tennessee, Illinois and part of Iowa. Vince Bruce is district sales manager. A similar sales district for the company's metal finishing division, under the management of Harry Brown, will comprise approximately the same territory with headquarters in Dayton, O., and warehouse facilities in Springfield, O.

* * *

H. K. Porter Co., Pittsburgh, plans to acquire the business of McLain Fire Brick Co., manufacturer of refractory fire brick, sleeves, nozzles, runners and hot tops for use in steel plants and metal refineries. The McLain Co., founded in 1903, operates six plants in Ohio and Pennsylvania. Operations will continue as the McLain Fire Brick Co., Division of H. K. Porter Co.

* * *

Detroit office of Lindberg Engineering Co., managed by Frank J. Condit, has moved into its new, modern offices at 1220 South Woodward Ave., Royal Oak, Mich.

* * *

Lobdell United Co., Wilmington, Del., a wholly owned subsidiary of United Engineering & Foundry Co., Pittsburgh, has acquired the engineering, patterns, tooling and all rights to the manufacture and sale of the Bridgeport and Diamond lines of grinder and abrasive cut-off machines. These lines formerly were manufactured by the Bridgeport Safety Emery Wheel Co. and the Diamond Machine Co., Bridgeport, Conn. and by the Columbia Div. of Lodge & Shipley Co., from whom Lobdell purchased them on December 31.

* * *

National Cylinder Gas Co. will begin construction immediately of a $3,500,000 plant for manufacturing and distribution of liquid oxygen. The new one-story building will be built on an eight-acre tract near 109th and Torrence Sts. on Chicago's south side.

* * *

Capitol Foundry Co., Phoenix, Ariz., subsidiary of National Malleable & Steel Castings Co., has its new grinding ball foundry in operation and expects that its second new plant, for producing miscellaneous steel castings, will begin operations late this year.

* * *

Hanchett Mfg. Co., Big Rapids, Mich., has opened a new plant and warehouse at 5727 South West Macadam Ave., Portland, Oreg. Increased manufacturing facilities, additional replacement parts service, and sales and engineering service are available in the new location.

* * *

R. & J. Dick Co., Passaic, N. J., has opened a new southern California office and warehouse at 5276 Atlantic Blvd., Maywood, (Los Angeles). A complete inventory of power transmission and conveying equipment, including full service facilities, will be maintained.

* * *

Dow Corning Silicones Ltd., Canadian subsidiary of Dow Corning Corp., Midland, Mich., has moved into its new offices and warehouse on Tippet Rd., Wilson Heights, Toronto. D. C. R. Miller is general manager of the new company.

* * *

St. Paul Hydraulic Hoist, Minneapolis, has appointed Corts Commercial Body Works, Whitesboro, N. Y., exclusive distributor in the Utica, N. Y., trade area for the St. Paul line of hoists and bodies.

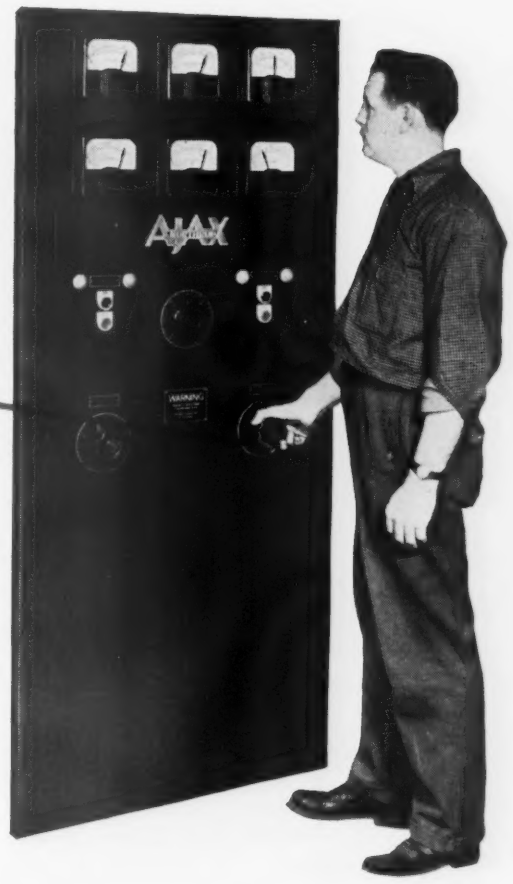
* * *

A new company, Timken Roller Bearing De Mexico, has been formed to handle the sale of products of the Timken Roller Bearing Co., Canton, O. Complete stocks will be main-

(*Concluded on page* 164)

EXPANSION PROGRAM: Mathews Conveyor Co., Ellwood City, Pa., started to break ground on Jan. 26 for an extensive expansion program. In addition to the three-story, 80 x 120-ft brick office and engineering structure shown here, plans call for the construction in the next year of an addition of about 25,000 sq ft to the present manufacturing area

COMPLETE CONTROL



makes AJAX-NORTHRUP induction melting...

1. FASTEST
2. MOST PRECISE
3. MOST ECONOMICAL

Consider carefully . . . when an AJAX 50 kw furnace melts steel faster than any other furnace, there must be a difference. There is. Kw for kw, an Ajax-Northrup furnace *always* provides the shortest melting time due to its highly developed, easy-to-operate controls.

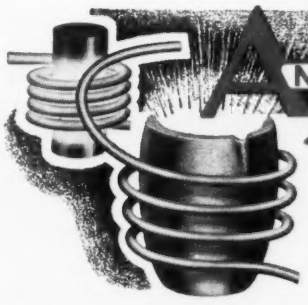
The flexibility of Ajax-Northrup controls permits faster melting because power input can be kept at a constantly high value . . . despite changes in electrical characteristics that occur during the melt. This flexibility also means more precision in casting since pouring temperatures can be maintained exactly as desired.

Ajax-Northrup controls incorporate a rotary power factor switch which is a fool-proof interlocked system. Capacitor steps are conveniently added by single units without guesswork. If any unit is removed, the power supply is automatically opened. Power is likewise controlled by a rotary tap switch adding flexibility to furnace operation. Voltage is controlled by a single rheostat which gives the operator full control from near zero to the maximum rating.

Speed and precision of Ajax-Northrup controls also mean down-to-earth economies in production. Fast melting practically eliminates oxidation and all the foundry losses that go with it. Recovery of alloying elements is consistently high . . . in at least one case, nickel recovery is 100%; chromium 99%; molybdenum 95%. Add these advantages to fewer rejects and easier alloying, then you can realize the extent to which Ajax-Northrup controllability pays off.

We would be pleased to send you descriptive literature. Simply advise us as to the metals melted and the capacity of your melts.

544



AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING

AJAX ELECTROTHERMIC CORPORATION • AJAX PARK, TRENTON 5, NEW JERSEY

Associated Companies: Ajax Electrometallurgical Corp. • Ajax Electric Furnace Co. • Ajax Electric Company, Inc. • Ajax Engineering Corp

(*Concluded from page* 162)

tained to service the Mexican market. A. E. Porter, who has represented Timken in Mexico for several years, has been appointed manager of the new company. He will be aided by four sales engineers.

* * *

Marietta Concrete Corp., Marietta, O., has added sales representatives for its Industrial Silo Division in four cities: Mayer & Oswald, 37 West Van Buren St., Chicago; Matt A. Doetsch Machine Co., 1625 I St. N.W., Washington 6; Alcar Builders Specialties Inc., 1315 Buttonwood St., Philadelphia 23, and Critz Engineering Co., 575 Wirham Pl., Cincinnati 20.

* * *

Florida Machine & Foundry Co., 1561 West Church St., Jacksonville 5, Fla., plans a $250,000 expansion and modernization program to include new equipment and enlarging of building space. A new electric furnace will be installed that will double the plant's melting capacity for steel castings.

* * *

A new foundry, Quaker Alloy Casting Co., which will specialize in small carbon, low-alloy, stainless and high-alloy castings, has been established at Myerstown, Pa. Leroy G. Miller, John W. Juppenlatz and James J. Blauch, formerly associated with the Lebanon Steel Foundry, Lebanon, Pa., are founders of the new company. FOUNDRY regrets that name of this foundry was reported incorrectly in "Late Foundry News," February issue, page 34.

* * *

Pattern and foundry shops of J. & W. Holly Inc., 529 South East St., Holyoke, Mass., were practically destroyed by fire on Feb. 13. Cause of the fire is unknown, and initial estimates place the damage at $200,000. Information about resumption of production is indefinite.

* * *

American Hardware Corp., New Britain, Conn., has discontinued production of gray iron castings. About 40 employees affected by the move will be engaged in anticipated expansion of aluminum, brass and bronze casting production.

* * *

Periola Oil Co. has moved into new offices at 14300 West McNichols Rd., Detroit 35. Former address was the Penobscot Bldg.

* * *

Gruner Iron Works Inc., foundry and machine shop, 109 North 7 St., Fulton, N. Y., has been incorporated listing capital stock of 300 shares, no par value. Hillick & Hillick, 53 South First St., Fulton, filed the papers. Directors of the company, all of Fulton, are Edgar F. Hill, J. Sheridan Hillick, and Arthur J. Peluso.

* * *

Torrington Mfg. Co., Torrington, Conn., has completed a subsidiary plant at Oakville, Ontario, Canada. The new plant will make fan blades and blower products for the Canadian market.

* * *

Mars Engineering Inc., 375 South St., Newark 5, N. J., has added a new division to handle design of industrial dust collection and fume elimination systems.

Celebrates Centennial

Roots - Connersville Blower, Division of Dresser Industries Inc., 754 Illinois Ave., Connersville, Ind., is celebrating its 100th anniversary in the manufacture of centrifugal blowers and exhausters, displacement meters, pumps, generators, compressors and other allied equipment to move gas and air. Since 1854, moving gas and air has been its only business.

Meetings of Interest to Foundrymen

Apr. 5-7—American Institute of Mining & Metallurgical Engineers, national open hearth conference, Palmer House, Chicago

Apr. 8-9—Malleable Founders' Society, market development conference, Carnegie Institute of Technology, Pittsburgh

Apr. 14-16—Society for Experimental Stress Analysis, spring meeting, Netherland Plaza Hotel, Cincinnati

May 3-5—Air Pollution Control Association, annual meeting, Patten Hotel, Chattanooga

May 4-7—American Welding Society, national spring technical meeting, Hotel Statler, Buffalo

May 5-7—American Society of Training Directors, annual conference, Hotel Schroeder, Milwaukee

May 5-7—American Welding Society, welding and allied industry exposition, Buffalo Memorial Auditorium, Buffalo

May 8-14—American Foundrymen's Society, annual convention and exhibition, Public Auditorium, Cleveland

May 16-19—Industrial Furnace Manufacturers Association, spring meeting, the Homestead, Hot Springs, Va.

May 17-20—Basic Materials Exposition, International Amphitheater, Chicago

June 9-11—American Society for Quality Control, annual convention and exhibit, Hotel Jefferson, St. Louis

June 14-15—Malleable Founders' Society, annual meeting, Seigniory Club, Province of Quebec, Canada

June 14-18—American Society for Testing Materials, annual meeting, Hotels Sherman and Morrison, Chicago

Sept. 13-20—Instrument Society of America, International Instrument Congress and Exposition, Convention Hall and Commercial Museum, Philadelphia

Sept. 27-28—Steel Founders' Society of America, fall meeting, the Greenbrier, White Sulphur Springs, W. Va.

Oct. 6-8—National Foundry Association, 56th annual meeting, La Salle Hotel, Chicago

Oct. 14-15—Michigan Regional Foundry Conference, University of Michigan, Ann Arbor, Mich.

Oct. 14-16—Foundry Equipment Manufacturers' Association, annual meeting, the Greenbrier, White Sulphur Springs, W. Va.

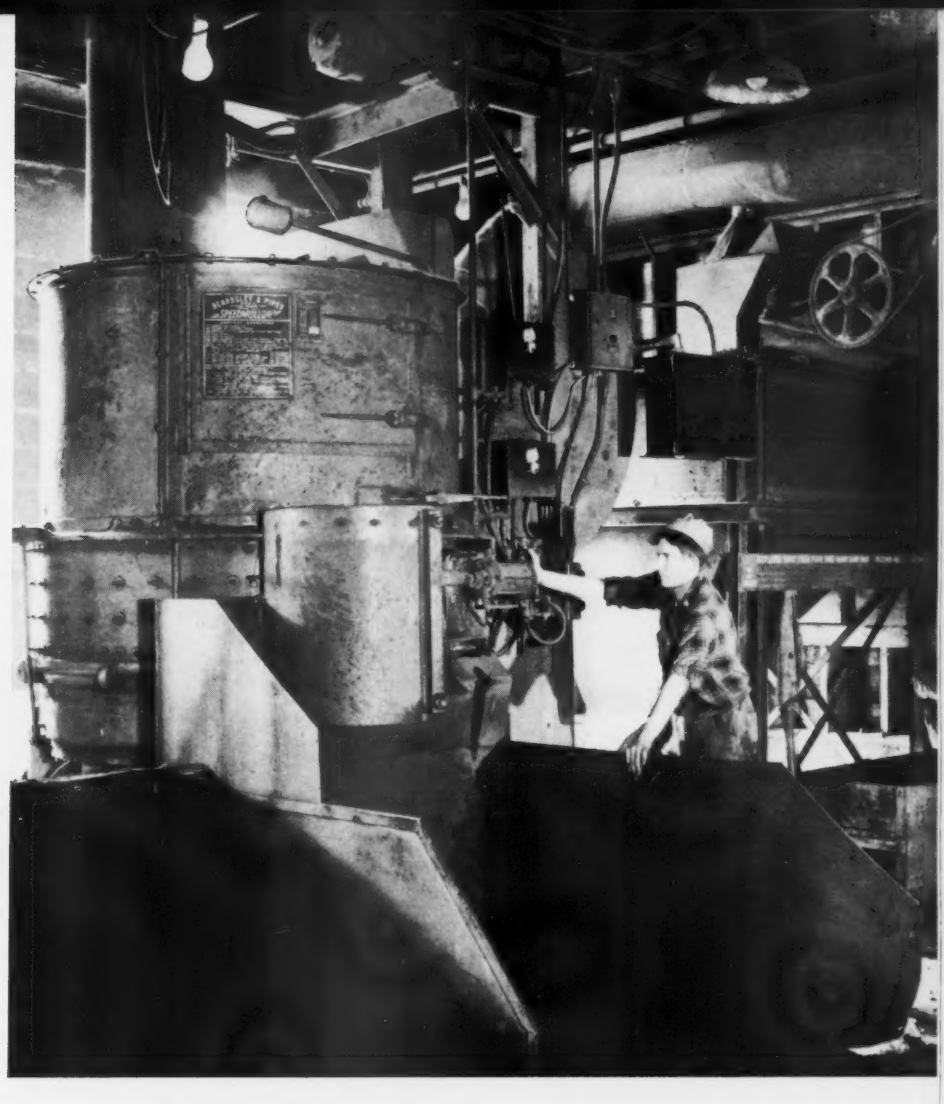
Oct. 27-29—Grinding Wheel Institute & Abrasive Grain Association, fall meeting, Edgewater Beach Hotel, Chicago

Nov. 1-5—American Society for Metals, National Metal Congress and Exposition, International Amphitheater, Chicago

Nov. 11-12—Gray Iron Founders' Society, annual meeting, the Homestead, Hot Springs, Va.

Dec. 1-4—American Institute of Mining & Metallurgical Engineers, electric furnace steel conference, Hotel William Penn, Pittsburgh

A 60% SAVING IN MATERIAL AT OTACO LIMITED



SPEEDMULLOR SAVES ON BONDING MATERIAL AND MAN-HOURS

Otaco Limited at Orillia, Ontario, solved their sand preparation problem by installing a Model "60" Speedmullor to mull all of the foundry's molding sand.

The *thoroughness* of Speedmullor mulling resulted in a 60% reduction in bonding material per batch.

The *speed* of Speedmullor mulling cut sand preparation labor costs by up to 40%.

The *accurate control and uniformity* of Speedmullor mulling boosted casting quality and surface finish.

Results like this can be yours—write now for full information to *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Ave., Chicago 39, Illinois.*

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

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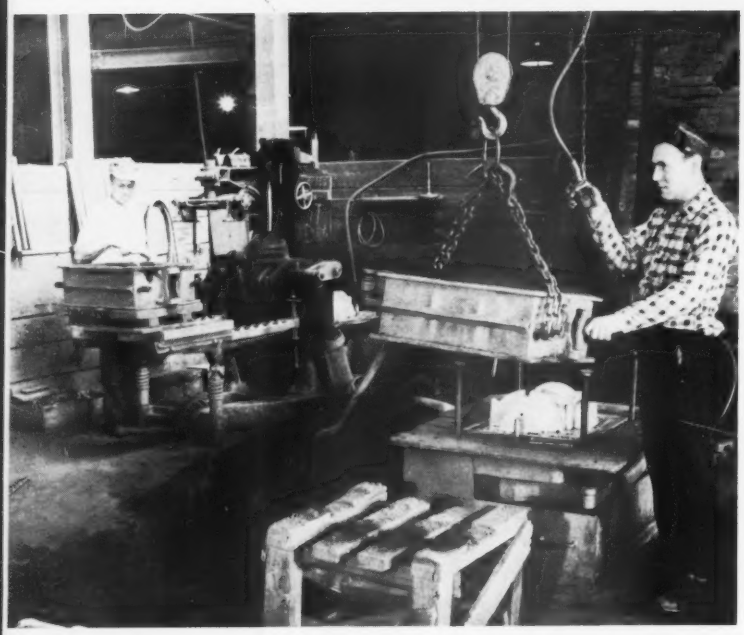
WHEN THE PRESSURE'S ON



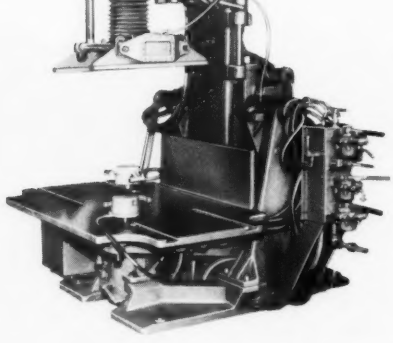
Large valve and hydrant casting molds are made on these cope and drag machines. For copes—a J&J 812S Jolt Stripper—capacity 1600 lbs.—table size 25 x 30 inches. For drags—a J&J 612 RPB Jolt-Rollover-Draw—capacity 600 lbs.—table size 24 x 30.

PHILIP GIES FOUNDRY CHOOSES J&J MACHINES

For molding a large variety of pressure work, the Philip Gies Foundry at Kitchener, Ontario, installed J&J Jolt-Rollover-Draw and Jolt-Stripper molding machines. Results have been so satisfactory that the foundry is now installing another large J&J Jolt-Stripper . . . to make molds in large quantity for 7-foot hydrant castings.

The machines at Philip Gies have been giving top performance for many years. Newer J&J machines offer many improved features. The popular new J&J 920 RB machine shown below features an automatic adjustable flask equalizer and automatic pattern board clamp. J&J Rollovers are available in capacities to 10,000 lbs. Write now for full information to *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Ave., Chicago*

Hydrant casting molds are made in quantity on this J&J 68S Jolt-Stripper. Flasks up to 24 x 36 inches are handled on this 600 lb. capacity machine.



The new J & J 920 RB with automatic pattern board clamp.

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

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SOUTHEASTERN FOUNDRYMEN MEET

Chattanooga Site of Successful Conference

By WILLIAM G. GUDE
Managing Editor

TENNESSEE Chapter of the AFS took over the role of host for the first time at the Southeastern Regional Foundry Conference held at Hotel Patten, Chattanooga, Feb. 18-19. The annual meeting measured up fully to the success attained by the 21 previous conferences held in Birmingham, judged from the standpoints of interest, quality of program and attendance.

Both the Birmingham District Chapter and the University of Alabama Student Chapter co-operated in sponsorship of the conference, which had Paul L. Arnold, resident manager, U. S. Pipe & Foundry Co., Chattanooga, as general chairman.

A diversified and interesting program of ten technical discussions, arranged by a committee headed by Charles S. Chisolm, the Wheland Co., Chattanooga, and J. A. Wickett, Sloss-Sheffield Steel & Iron Division, Birmingham, was presented Thursday morning and the two afternoons.

Visit Local Foundries

Most of the conference visitors inspected local plants Friday morning in a well planned visitation program conducted by a committee under the chairmanship of Karl Landgrebe, the Wheland Co.

A luncheon session Thursday and a banquet Friday evening completed the program. Mayor P. R. Olgiati of Chattanooga welcomed visitors at the luncheon, presided over by Paul L. Arnold. Principal speakers were Frank J. Dost, national AFS vice president and president, Sterling Foundry Co., Wellington, O., and William W. Maloney, AFS secretary-treasurer. They brought their listeners up to date on national association activities, including plans for the annual convention to be held in Cleveland, May 8-14. L. N. Shannon, vice president, Stockham Valves & Fittings Inc., Birmingham, a past president of AFS, was called on for brief remarks.

G. Frank Anderson, past chairman of the Tennessee Chapter, was toastmaster at the banquet, which was presided over by Chapter President William P. Delaney, Eureka Foundry Co. Jim Nance McCord, former governor of Tennessee, pinch-hit for the ailing Senator Estes Kefauver, the scheduled speaker, and discussed the industrial potentials of Tennessee as well as its activities in conservation of natural resources.

The opening technical session had Gosta Vennerholm, Ford Motor Co., Dearborn, Mich., as speaker and J. E. Reynolds, U. S. Pipe & Foundry Co., Bessemer, Ala., as chairman. Mr. Vennerholm discussed recent trends in cupola design and operation, with particular reference to the application of hot blast and water cooling. This included a description of the so-called metallurgical blast cupola developed by the Compagnie Generale des Conduites d'Eau, Liege, Belgium. A unit of this design installed by Ford employs a well and hopper top similar to that of a blast furnace. It is water cooled, has a graphite-lined well but no drop bottom. Blast air is given a 1000° preheat.

Active in conference arrangements were: Standing—Paul L. Arnold, general chairman; E. E. Pollard, vice chairman of Birmingham Chapter. Seated—W. P. Delaney, chairman, Tennessee Chapter, and B. W. Worthington, chairman at Birmingham

At the following session, presided over by Tom Alford, the Wheland Co., Clyde Sanders, vice president, American Colloid Co., Chicago, presented an instructive analysis of the causes of numerous casting defects, many of which are attributable to incorrect sand practice. In discussing synthetic sand mixtures, he emphasized the necessity for proper mulling and proper sand control, and pointed out the trouble encountered when the sand is cooled insufficiently before reuse.

The foundry's supervisory staff should participate in any sound incentive plan that is intended to control costs, work quality and production, it was stated by C. J. Pruet, chief industrial engineer, McWane Cast Iron Pipe Co., Birmingham, at a session at which N. D. Neptune, National Cast Iron Pipe Co., Tarrant City, Ala., was chairman. Supervisors cannot be expected to consistently give their best efforts without a strong motivating power such as an incentive plan can provide, he said.

Describing the incentive program used by the McWane company, Mr. Pruet reported that savings of about 80,800 man-hours were effected per year by cost-conscious supervision without a large cost for new equipment.

Discuss Shell Molding

The fourth technical session was devoted primarily to shell molding, with Walter Coleman, Southern Shell Mold Equipment Co., Chattanooga, as chairman. James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich., made some introductory remarks before showing the film "Shell Molding and Methods Engineering." This describes Central Foundry Division's shell molding practice as well as its efforts toward more efficient handling of various other plant operations.

Clifford E. Wenninger, National Engineering Co., Chicago, discussed foundry sand reclamation at a session presided over by H. M. Barker, U. S. Pipe & Foundry Co. Mr. Wenninger described in detail the pneumatic system of dry reclamation developed within the last few years, and indicated that existing steel foundry installations of this type have reduced new sand requirements by 75 per cent.

At the concluding session the opening day, with W. M. Hamilton, the Crane Co., Chattanooga, presiding, William N. Davis, AFS, Chicago, out-

(*Concluded on page* 170)

Scientists and engineers at the new VCA Research Center—working with complete, modern facilities for metallurgical research of every type—stand ready to help you find solutions to your most difficult technical problems.

VANCORAM BRAND

Producers of alloys, metals and chemicals

Initial building of the new Vanadium Corporation Research Center at Cambridge, Ohio.

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GRAYBAR BUILDING

420 LEXINGTON AVENUE

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WILLIAM C. KEELEY
PRESIDENT

An important message to the metals industry

On December 1, 1953, Vanadium Corporation of America opened at Cambridge, Ohio, the initial building of its new Research Center.

The new Center is dedicated to just one end: to help you develop and produce ever better, ever more versatile metals through helping you find new, practical solutions to your most difficult technical problems.

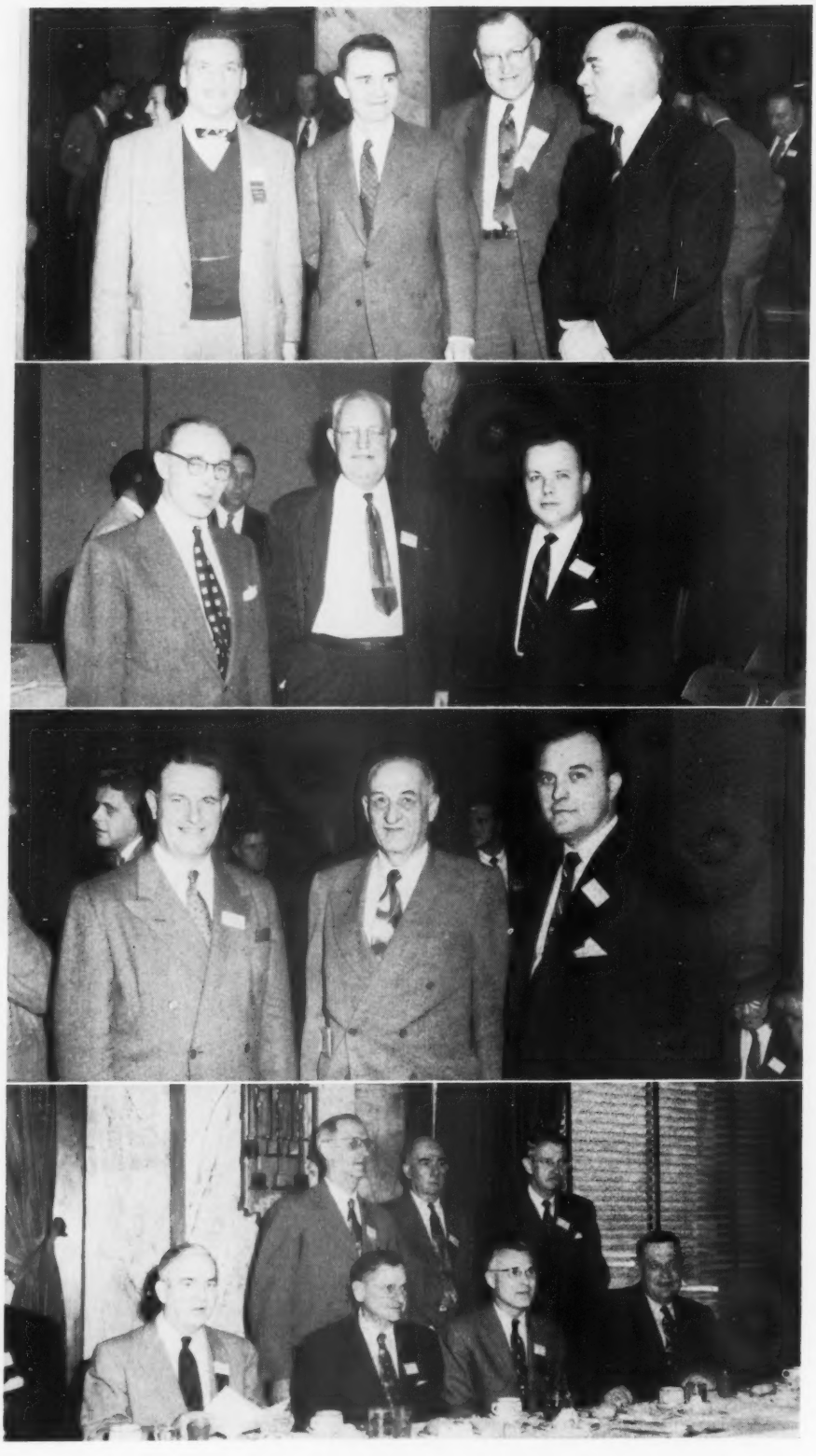
To achieve that end, we have made the new Center what we believe to be one of the finest of its type anywhere in the metals industry.

We have made it a living symbol of the traditions, the achievements, the ultimate goals shared by Vanadium Corporation and the metals industry as a whole — as well as a new means to future service and prosperity for both.

We cordially invite you to visit our new Research Center next time you are in the vicinity.

President

Vanadium Corporation of America



Some of the participants in the Southeastern Regional Foundry Conference. Top panel, left to right: John Drenning, Birmingham District Chapter secretary-treasurer; C. S. Chisolm, Tennessee Chapter vice chairman; Charles Saunders, Tennessee Chapter director; W. P. Delaney, Chattanooga Chapter chairman. Second panel: D. L. Shannon, Somerville Iron Works; Glenn Merrifield and W. E. Dougherty, Giffels & Vallet Inc. Third panel: L. B. Knight, Lester B. Knight & Associates Inc.; Tom Butler and Roy Nosek, Beardsley & Piper Division; Bottom panel: Standing—Paul Arnold, conference chairman; W. P. Delaney; B. W. Worthington, Birmingham District Chairman. Seated—W. W. Maloney, AFS secretary-treasurer; L. N. Shannon, Stockham Valves & Fittings Inc.; Frank J. Dost, AFS vice president; and Mayor P. R. Olgiati

(*Concluded from page* 167)

lined activities of the society in the fields of safety, hygiene and air pollution. Working committees are studying various projects selected by an over-all steering committee, and their reports and recommendations will be issued from time to time.

Discussing plant safety, Mr. Davis emphasized that responsibility for attaining safe conditions must be widespread — encompassing supervisors and their men as well as management. It's human failure, not the machine, that causes most accidents, he asserted.

Profs. Warren Jeffery and E. C. Wright, University of Alabama, spoke at one session, presided over by John Lasater, Combustion Engineering Co., Chattanooga. Professor Jeffery described the school's use of cobalt 60 in the foundry laboratory for nondestructive testing use. Professor Wright, discussing the Foundry Educational Foundation training program at the university, said that 60 per cent of the students taking the foundry course stay in the industry after graduation.

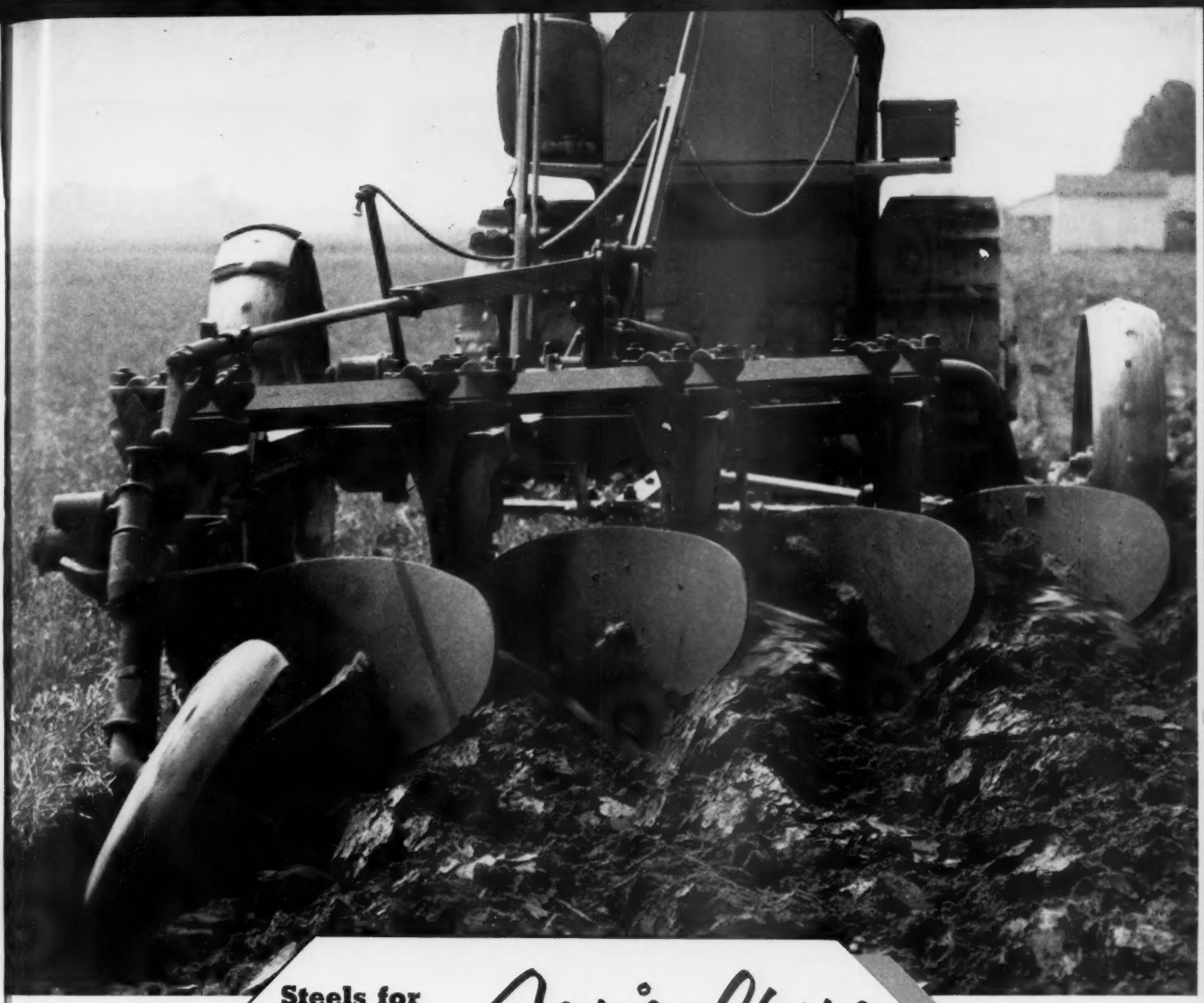
Incorporate Automatic Features

Recent developments in molding machine design were described by Glenn Merrifield, Giffels & Vallet Inc., Detroit, at a session that had Dave Shannon, Somerville Iron Works, Chattanooga, as chairman. These developments included various makes of high-speed units incorporating a number of automatic features.

The speaker emphasized that the foundry planning to install high-production molding units should first study their effect on other departments—such as sand mixing and cleaning room capacities—to determine what changes are necessary for the machines to be most effective.

The final technical session had Thomas F. Kiley, Meehanite Metal Corp., New Rochelle, N. Y., as speaker and Paul Stuff, Ross-Meehan Foundries, Chattanooga, as chairman. Mr. Kiley presented a detailed and well illustrated discussion of the various factors that contribute to effective gating practice. Among subjects covered were pouring basin design, size and location of sprue, runner bars and ingates, and use of skim gates and strainer cores.

He summarized the steps in gating as 1) decide if the casting is to be poured fast, medium or slow, 2) determine poured weight of the casting, 3) determine the time required to pour, 4) select sprues to give the desired pouring speed, 5) provide suitable dirt traps and chokes, 6) distribute the ingates properly.



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The performance of GLC GRAPHITE ELECTRODES is unsurpassed in the processing of electric steels, foundry castings, ferroalloys and magnesium. Our facilities have been greatly expanded to keep pace with the growing emphasis on electric furnace steel production.

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Fig. 1—One-ton charge of scrap and pig iron is loaded into drop-bottom box resting on portable scales on forks of lift truck. Metal is weighed by types

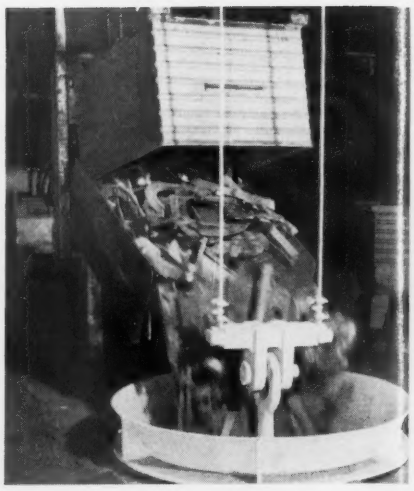

Fig. 2—Dropping charge into mobile loading bucket recessed in floor

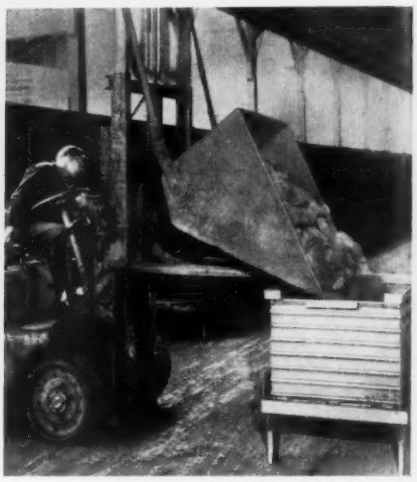

Fig. 5—End-loading scoop converts lift truck into a front-end loader

FOUNDRY CUTS COSTS

With Moderate Investment

HOW a medium size foundry can produce important savings with a nominal capital investment has been demonstrated by the Union Metal Mfg. Co., Canton, O. The company has operated its own foundry for more than 30 years.

The foundry specializes in gray iron castings which it makes, along with other castings, for both Union Metal and numerous other manufacturers and steel mills. Capacity of the foundry is 50 tons per day. Largest production items are small and medium size castings of high-tensile strength.

Man-hour savings of 62.5 per cent and coke reduction of about 15 per cent resulted from modernization of cupola charging methods, accomplished at a total cost of approximately $15,000. At the same time working conditions were greatly improved, and men were freed for more productive work on other operations.

Prior to renovating the cupola, charges were prepared by hand, and all charging was done manually. Generally, six men worked from 7 a.m. until noon preparing the day's charges. Two of these men then began hand charging operations while the others continued making up charges for the remainder of their shift.

Under this old system, five men hauled heavy wheelbarrow loads of various types of scrap and pig iron from the yard to a centrally located scales. There a fifth man supervized the weighing of each kind of scrap and pig iron used in the charge. As the scrap and pig iron were loaded into a conventional bin box set on the scales, the weight was checked. When a 1-ton charge had been prepared, the loaded box was placed on a hand platform truck, which two men pushed and pulled to the elevator—some 100 feet from the scrap pile.

Boxes were lifted one at a time on the elevator to the second floor charging platform, where they were removed by another platform truck and stored until charging began. When charging started, the boxes were hauled to the charging door, and two men lifted the pieces from the box and threw them into the cupola.

Coke and limestone were collected by wheelbarrow, carried up to the platform on the elevator, and stockpiled for later use during charging operations.

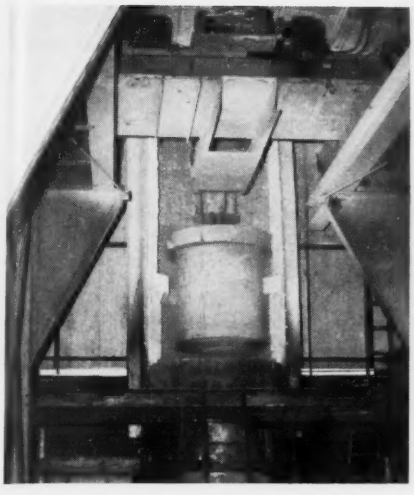

Fig. 3—Mobile charging bucket being lowered to ring ledge in cupola stack

Fig. 4—Truck operator with end-loading scoop removes used core sand and core wire from cleaning room floor in 30 minutes. Two men worked six hours before

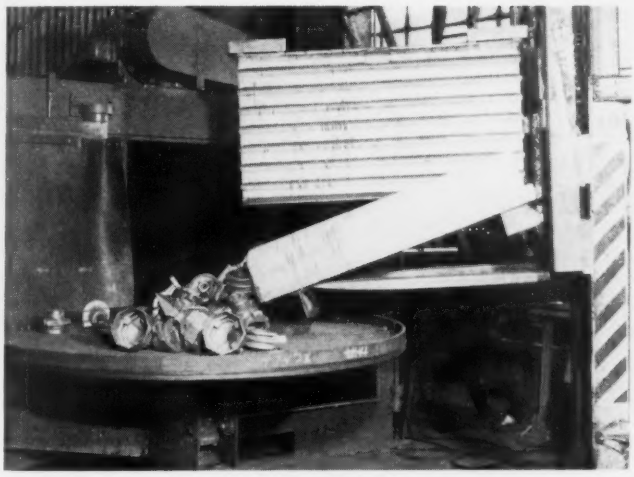

Fig. 6—Castings being dumped from a drop-bottom box onto the revolving table of an airless shot blast unit

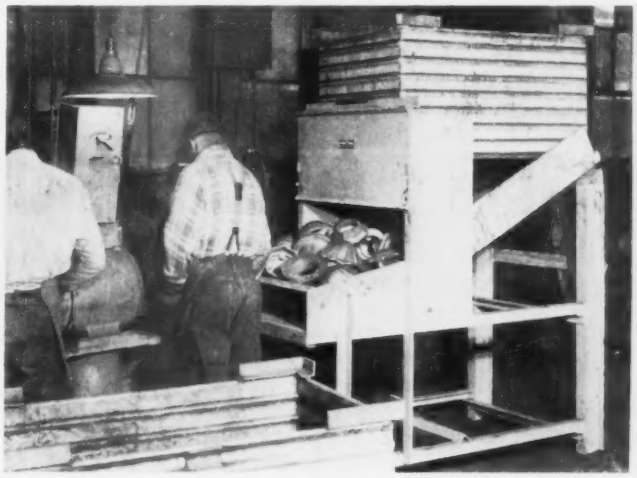

Fig. 7—Castings are work positioned at grinder. Box is on positioning stand, drop-bottom serving as chute

Now, the foundry's cupola is charged mechanically, and the method of preparing charges has been greatly simplified. Most of the costly and time-consuming rehandling of charges has been eliminated. Substantial savings in both coke and manpower resulted.

Hand charging was eliminated through use of a charging bucket (Fig. 3). Work-O-Matic drop-bottom boxes, materials handling containers made by Union Metal, have replaced both wheelbarrows and the old bin boxes. Portable scales are brought to the material now instead of heavy wheelbarrow loads of material being pushed to stationary scales.

The cylindrical charging bucket is 42 in. in diameter and 54 in. high, and is equipped with a cone-shaped drop bottom. The bucket is recessed into the floor for ground level loading (Fig. 2), lifted 30 feet to the foundry ceiling, moved along a craneway to the cupola, and then lowered into a wishbone at the top of a No. 7, 72-in.-diam cupola for charging. An automatic electric hoist with pushbutton magnetic controls is used.

The drop-bottom boxes are made of 12 gage corrugated steel. Their hinged bottom is formed from a one-piece steel plate, turned up at the sides to form a chute for drop-bottom dumping. They are tierable, quickly fork-lifted from any of five directions and accommodate 6000 pounds in a volume of 20.2 cu ft.

Probably the greatest savings realized by the foundry have resulted from using these boxes in the make-up and dumping of the charge into the bucket. Time required to make up the day's charges and dump them into the cupola has been reduced from 40 man-hours to only 15, a saving of 62.5 per cent.

Two men, instead of the six previously needed, make up charges and do the charging. A fork truck operator picks up the portable scales. With the scales resting on his truck forks, he then picks up a box (Fig. 1) and carries it to the material yard. There a second man helps load the proper weights of each kind of scrap and pig iron used to make up the charge into the box, weighing as they load. Thus a 1-ton charge is loaded into the box.

The fork truck operator takes the loaded box to a runway adjacent to the cupola. He gets the boxes containing the charges in one row, and boxes of coke, similarly weighed, in a second row. Thus the day's charges are prepared and lined up.

Now the same two men conduct actual charging operations. The fork truck operator drop-bottom dumps box loads of coke into the recessed

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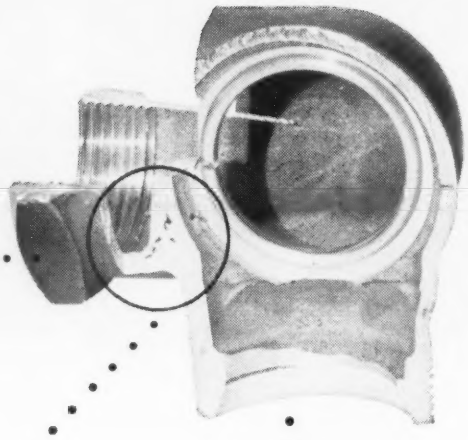
THERE IS A SOLUTION TO YOUR COSTLY... *Foundry Problems..*



Shrinkage

When you call upon LAVIN'S ENGINEERING SERVICE

SHRINKAGE IS ONE OF MANY PROBLEMS THAT CONFRONT THE FOUNDRYMAN . . . . .

There are various conditions which contribute to shrinkage and too often many valuable machine hours and manhours have been lost before this defect is uncovered. Melting practice, pouring temperature, gating and risering practice and choice of alloy are all factors influencing this condition.

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Lavin's metallurgical staff is always ready to assist the foundryman in finding the solution of any routine or special casting problem. Our chemical and research laboratories are available to you at no cost or obligation.

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(*Concluded from page* 173)

charging bucket. The other man, acting as charging operator, adds a few shovels of limestone. The hoist, operated with ground floor magnetic controls, lifts the bucket to the cupola for charging and returns it to its recessed position at ground level. The fork truck operator drop-bottom dumps a box containing the charge of metal scrap and pig iron into the bucket. The charging operator adds specified quantities of nickel, chromium or molybdenum and the cycle continues. The cupola can be given a 1-ton charge every two and a half minutes.

Actual dumping of the coke and scrap from the drop-bottom boxes into the charging bucket is done with amazing accuracy. The discharge point remains constant throughout the dumping operation, and discharge is always off the chute end of the box bottom, beyond the fork ends. The fork truck operator raises his auxiliary lifting mast. The truck's fork ends rest against an I beam abutment on the box bottom. The hinge end of the box moves outward, away from the lifting mast, and the scrap or coke flows off the box's chute and into the charging bucket.

Make Coke Savings

Only one of the two men who do the charging spends his full shift in preparing and dumping the charges. The other spends his last hour at other work inside the foundry.

Under the new method, it was discovered that coke savings of 15 per cent resulted. This coke saving is due in part to exact measurements of coke made possible with the portable scales, and in part to better distribution of the coke around the perimeter of the cupola. This in turn results in a more uniform and constant heat.

The foundry achieved further substantial savings by altering the method of removing sand from the molding floors and used core sand and core wires from the cleaning room. Previously, two men worked approximately six hours shoveling the sand into side dump trailer trucks. Another Union Metal product, the end loading scoop, has eliminated this fatiguing chore (Fig. 5). This scoop quickly converts a fork truck into a front end loader. The fork truck operator attaches the connecting arms of the scoop to his truck's auxiliary lifting mast, and collects the sand by himself in half an hour—a 95.8 per cent savings in manpower.

To make a scoop bite into a pile of sand, the fork truck operator lowers his forks to position the scoop at ground level. He raises his auxiliary mast, dropping the scoop edge. After he digs into the pile of sand, he lowers his lifting mast, thus raising the scoop edge until it is completely righted. The scoop can also be used to handle coke or castings (Fig. 4).

In summary, a $15,000 investment has paid rich dividends to this medium size foundry. Hand charging was eliminated, make-up operations were greatly simplified, and handling procedures were mechanized. Portable scales replaced a weighing station, and made it possible to take the scales to the material. Results of over-all modernization are reflected in man-hour savings of 62.5 per cent in make-up and charging and 95.8 per cent in clean-up, coke savings of 15 per cent, and greatly improved working conditions.

Names Contest Winners

Malleable Founders Society has announced the winners of its third annual self-improvement safety contest. This contest recognizes the plant in each of three groups which makes the greatest reduction in the accident frequency rate for the current year as compared with its rate for the previous year. The winners are:

Group I—Less than 100 employees—Webster Mfg. Inc., Tiffin, O.

Group II—100 to 199 employees—Chain Belt Co., Milwaukee.

Group III—200 to 399 employees—Texas Foundries Inc., Lufkin, Tex.

Group IV—More than 400 employees—Terre Haute Malleable & Mfg. Corp., Terre Haute, Ind.

Each company winner reduced its accident frequency rate by at least 70 per cent. Accident frequency for the 60 plants participating was 21.7, a reduction of 27 per cent from the 1952 figure.

Caterpillar Employees Enjoy Safest Year

Caterpillar Tractor Co. employees, winners of the 1952 Award of Honor of the National Safety Council, have just completed their safest year in history.

In setting their new record, Peoria employees had only 2.2 lost time accidents for every million man-hours worked. This betters the previous record low of 2.7 set last year. Several departments within the company had no lost-time accidents during the year and the Metallurgical Laboratory completed its 11th consecutive year without a lost time accident.

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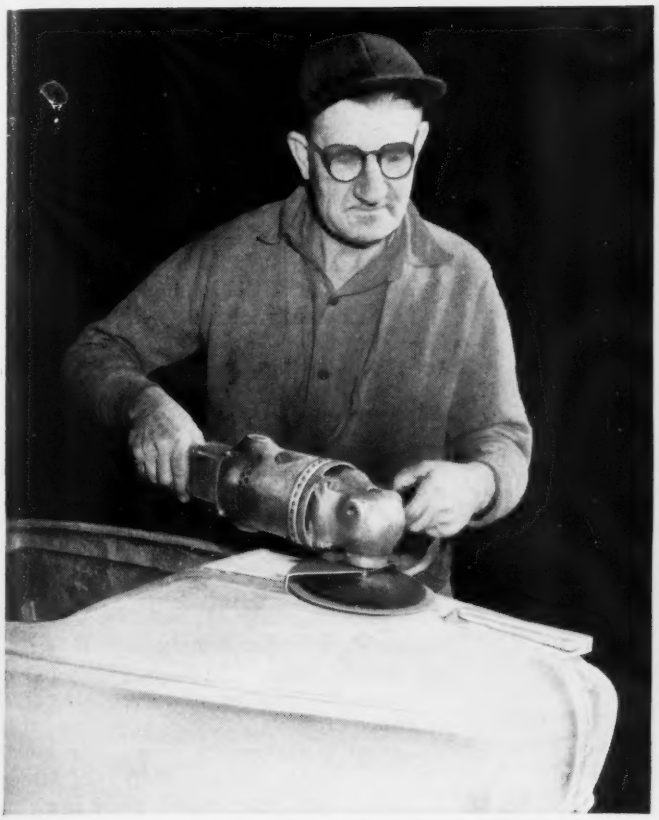

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FOR CUTTING-OFF AND SLOTTING operations, MX Production Cut-off Wheels combine rapid cutting with adequate safety... successfully withstand side pressures and heat shock. MX Depressed Center Wheels are also recommended for light cut-off and slotting with portable equipment—as are MX General Purpose Cut-off Wheels.

FOR ROUGH GRINDING, reducing and blending welds, use MX Discs, Depressed Center Wheels or Straight Wheels—depending on the nature of the job.

FOR FINISHING, polishing, deburring, etc., choose the MX abrasive product that best fits the operation; Straight Wheels, Mounted Wheels, Sticks for hand finishing, Depressed Center Wheels, Discs.

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Who's Excited?

. . . or what to do until your strait jacket arrives

Editor's Note: Any resemblance of the author's comments to scientific fact related to the production of sound castings is purely coincidental. George Pope, our business manager, says he was inspired to write these words (1) so his name would be recorded for posterity in *Foundry's* 1954 editorial index and (2) because there must be others, besides himself, who need to relax.

DO YOU get frustrated when you miss one section of a revolving door?

Does it bother you when the family cat stomps into the room, intruding upon your privacy?

Do you pace back and forth when you could just as well be sitting down?

Do you bear down on your pencil so hard you frequently break the point?

Do you drum on your desk with your fingers, twiddle your Phi Beta Kappa key, grind your teeth?

Do you lie awake at night, toss around and stew, fret about yesterday's, tomorrow's, next week's problems?

Do you wonder what, if anything, all this has to do with the practical and technical aspects of making or selling a casting?

If the answer is "yes" to one or more of these questions, the chances are that you have a mild to virulent case of tension—who doesn't?

All in fun and from one middle-aged business man deriving his livelihood from castings to another, we'd like to tell you about our recent "discovery" of some mighty interesting thoughts and ideas on the subject of *relaxation—the art of dropping tension.* In this atomic age, the complexities of plain living alone assure each of us our share of tensions—at home, at business and on the way back and forth.

Without having proclaimed the ability to do so, most of us assume we can outwork, outeat, outdrink, outplay, outsmoke, outproduce, undersleep our contemporaries. We'll catch up later.

We'll go fishing when the season opens this year for sure. We'll arrange that trip we've promised mother and the kids—this summer, too, because they'll be away at college before we know it. Yes, we'll take care of ourselves the next time we get a cold. We'll stay home a day or so before it really gets us down. And we're going to get to bed an hour earlier—starting tonight.

But, alas, what happens? We forgot about a meeting of the Civic Association and it's 11 p.m. when we're home again. We put the cat out, check the day's mail, glance at the evening paper—gad! It's five minutes past midnight. Shall we shower tonight or in the morning? Decisions, decisions! So it goes.

Then we decide to plan the fishing trip for fall because business is easing off a little and we should stick around. And we didn't get around to the trip to Williamsburg with the family because we were so busy with a rush of orders all spring that we completely forgot about it. The family became involved in other plans in the meantime. A cold in the head continues to bother us as it has for the past three weeks but we don't really feel sick enough to stay home. So we tell ourselves.

It's a good thing we're an optimist. Everything's going to be all right when this present rush is over. Manana—tomorrow. Unless, of course, the roof falls in all of a sudden as it did with our friend, Arthur Dalton. Art is sales manager of Chicago Wheel & Mfg. Co. We're much indebted to him for the urge to write as we do and for many of the thoughts and suggestions in these paragraphs.

If we may, allow us to tell you briefly what happened to him. A hard-working, energetic business executive, Art was dry-docked in Presbyterian Hospital in Chicago about 18 months ago with a serious heart attack and other complications brought on by working himself too hard too long. His doctor told him: "Listen, Art, I can treat you but I can't cure you all by myself. You must learn to relax if you want to regain your health and return to your normal pursuits. It's that, or else."

So Art went about the job of reading everything he could lay his hands on—thinking about and studying the subject of relaxation, the art of dropping tension. We wouldn't, of course, be writing this if the story didn't have a happy ending. Yes, he literally relaxed himself out of the hospital and back onto his job.

How did he do it? For one thing, he developed a routine of relaxing exercises which, at the insistence of unrelaxed friends, have been recorded on two sides of a 78-rpm record. We have the record and we think it's good for us. Of course, we still allow ourselves to worry too much about little things; there are times when the dishwasher seems awful noisy. However, we're making progress. The cat doesn't bother us with his heavy tread as much as before. We are learning to relax. If you own a record player, and if $1.95 (plus postage) seems like a worthy investment, we suggest you write to Relaxation Records, 520 N. Michigan Ave., Chicago 11, for the Art Dalton recording entitled "Easy Lessons in Relaxation."

It's a fact, of course, that all of us already know how and why we get tensed up—trouble is, we forget to practice what we already know. We need to remind ourselves and use this knowledge. A helpful "reminder" is to be found in available literature on the subject.

We have read and re-read a little 32-page pamphlet entitled "Relax" which Art Dalton sent us. The mental side of the picture counts most in relaxing, it says. For the capitol of your body is in your head. Here your private government sits and controls your affairs. From your brain comes the orders to your nerves and muscles. A jittery mental government flashing jittery orders makes for jittery nerves—and a jittery person.

The calm person conserves power. He employs no more than he needs to perform efficiently in any activity. He practices economy in the management of his body, and of his mind. It's in the book. Worry—and what to do about it (Stop resisting. Be willing to let things happen). Little lessons in laziness. Secrets of sound

(*Concluded on page* 181)

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SAVES SPACE FOR PLATES. Continuous flow of cores speeds up turnover of core plates. Fewer plates are needed and being of plywood, they are cheaper.

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Find out how you can improve *your* core room efficiency with THERMEX Equipment. Mail the coupon for free booklet. The Girdler Company, Thermex Division, Louisville 1, Kentucky.

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UNIT IS COMPACT. Entire baking operation is concentrated in this small area. Cores enter THERMEX unit at left . . . exit at right in 30 minutes or less, thoroughly baked.

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(*Concluded from page* 178)

sleep. All this and more. Written by Leonard M. Leonard, the pamphlet "Relax" was published by Birk & Co., 270 Park Avenue, New York 17.

One more suggestion. "How to Live a Hundred Years—Happily" is the subject of a talk given several years ago by Dr. John A. Schindler, the Monroe Clinic, Monroe, Wis., and now available in pamphlet form. We understand that Dr. Schindler is expanding his remarks into a full book to be published in the near future. As the doctor puts it: "It's easy to be cheerful and pleasant (relaxed) if you learn to do eight things:

1—Quit looking for a knock in your human motor.

2—Learn to like to work.

3—Learn to have a hobby.

4—Learn to like people.

5—Learn to be satisfied.

6—Learn to accept adversity.

7—Learn to say the cheerful, humorous thing.

8—Learn to meet your problems with decision.

What hopponed? Are you any more relaxed, just thinking about it as we have gone along? If you've done what we did (at the start of our thinking on the subject) you won't be relaxed because you've been gritting your teeth and firming up your muscles saying, "I'm going to relax starting right now!" Don't do it. It requires no effort to relax. It is just the opposite. It is the dropping of effort—all unnecessary effort, that is.

Thanks, Art Dalton, for steering our thoughts in this direction—and to you, dear reader, lots of good relaxing for a long, long time to come. Eas-y-y does it. Excuse our yawn. We're not bored or tired. We're just relaxed . . . . zzZz . . . . ZZzzzzzz . . . . zzzzzzzzzzzzzzzzzzzzz.

Editor's Note: Copies of the booklets "Relax" and "How to Live 100 Years" are available at the addresses mentioned in the text—in quantities of 20 or more at 10c and 15c each, respectively. On the chance that you are only tense enough to need a single copy of each, send 25c to Jeanne Franklin, Business Staff, FOUNDRY, 1213 West 3rd Street, Cleveland 13, O. We have purchased a quantity and will send one of each to you as fast as we can without getting too nerved up about it ourselves.

Book Review

Report on the Elevated-Temperature Properties of Chromium-Molybdenum Steels, paper, 208 pages, 8½ x 11 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $4.75.

This second of a series of reports prepared under the auspices of the ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals, is a graphical summary of the elevated-temperature strength data for chromium-molybdenum steels. It includes summary curves for tensile strength, 0.2 per cent offset yield strength, elongation and reduction of area, stresses for rupture up to 100,000 hr, stresses for creep rates of 1 per cent in 10,000 and 100,000 hr, and Larson-Miller master curves. Primary data from which the curves were prepared is given in an appendix, which also includes chemical composition, and other pertinent information on the various steels.

Iowa Management Course Is Planned for June

The 15th Management Course of the College of Engineering, State University of Iowa, will be held at the school, Iowa City, Iowa, June 14-26.

The areas of production planning, job evaluation, motion and time study, wage incentives, plant layout, materials handling, quality control, supervisory training, labor relations and legislation, organization and policy, and public speaking are included in this intensive course.

Regular State University faculty personnel are augmented by outstanding men from a variety of industries and other educational institutions.

Communications concerning the course should be sent to J. Wayne Deegan, 117 Engineering Bldg., State University of Iowa.

Career in Metal Film Widely Distributed

The color film strip, "A Career in Metal," with narrated recording and introductions for various type audiences produced by Northwestern Pennsylvania Chapter of the AFS Educational Committee, has been purchased by the following chapters and companies for showings in the schools of their locality:

Continental Foundry & Machine Co., East Chicago, Ind.; International Harvester Co., Chicago; Saginaw Valley Chapter, AFS; Detroit Chapter, AFS; Meadville Malleable Iron Co., Meadville, Pa.; American Brake Shoe Co., Meadville, Pa.; American Sterilizer Co., West Millcreek, Pa.; Maynard Steel Castings Co., Milwaukee; Ontario Chapter, AFS; Griswold Mfg. Co., Erie, Pa.; Ingersoll-Rand Co., Painted Post, N. Y.; Tanner Mfg. Co., Harborcreek, Pa.; Chicago Chapter, AFS; Oberdorfer Co., Syracuse, N. Y.; General Electric Co., Lawrence Park, Pa.; Michiana Chapter, AFS; Whiting Corp., Harvey, Ill.; Consolidated Pattern Co., Erie, Pa.; Dalton Foundries, Warsaw, Ind.; Central Indiana Chapter, AFS Mo-Kan Chapter, AFS; Western New York Chapter, AFS; American Foundrymen's Society, Chicago.

Aimed at encouraging young men to enter the foundry industry, many letters of commendation have been received from educators praising this contribution to the foundry industry by the Northwestern Pennsylvania Chapter.

Information regarding the program may be had from Earl M. Strick, Erie Malleable Iron Co., Erie, Pa.

BEAUTIFICATION AWARD: In recognition of achievement in industrial landscaping and beautification, Frank G. Hough Co., Libertyville, Ill., manufacturer of tractor-shovels and towing tractors, has been named by the American Association of Nurserymen as one of 13 award winning firms in the nation in its "Plant America" contest. The area leading to and surrounding the Hough plant covers more than three acres and contains seasonal flowers, lawns, shrubs, evergreens and shade trees

Let's talk sense about t

FOR AUTOMATION OR MODERNIZATION . . . YOU NEED MOLDING MACHINES DESIGNED TO HANDLE VARYING PRODUCTION REQUIREMENTS

THE problem of achieving greater economy and efficiency in the face of rising costs must be met by every foundry according to its specific requirements. For some, the answer lies in *automation* . . . the use of fully automatic machinery and systems which can operate with minimum supervision and human effort. For others, whose plant size and production volume do not permit the use of complex coördinated equipment, the solution is *modernization* . . . the replacement of obsolete models with improved machines engineered for efficient low-cost operation.

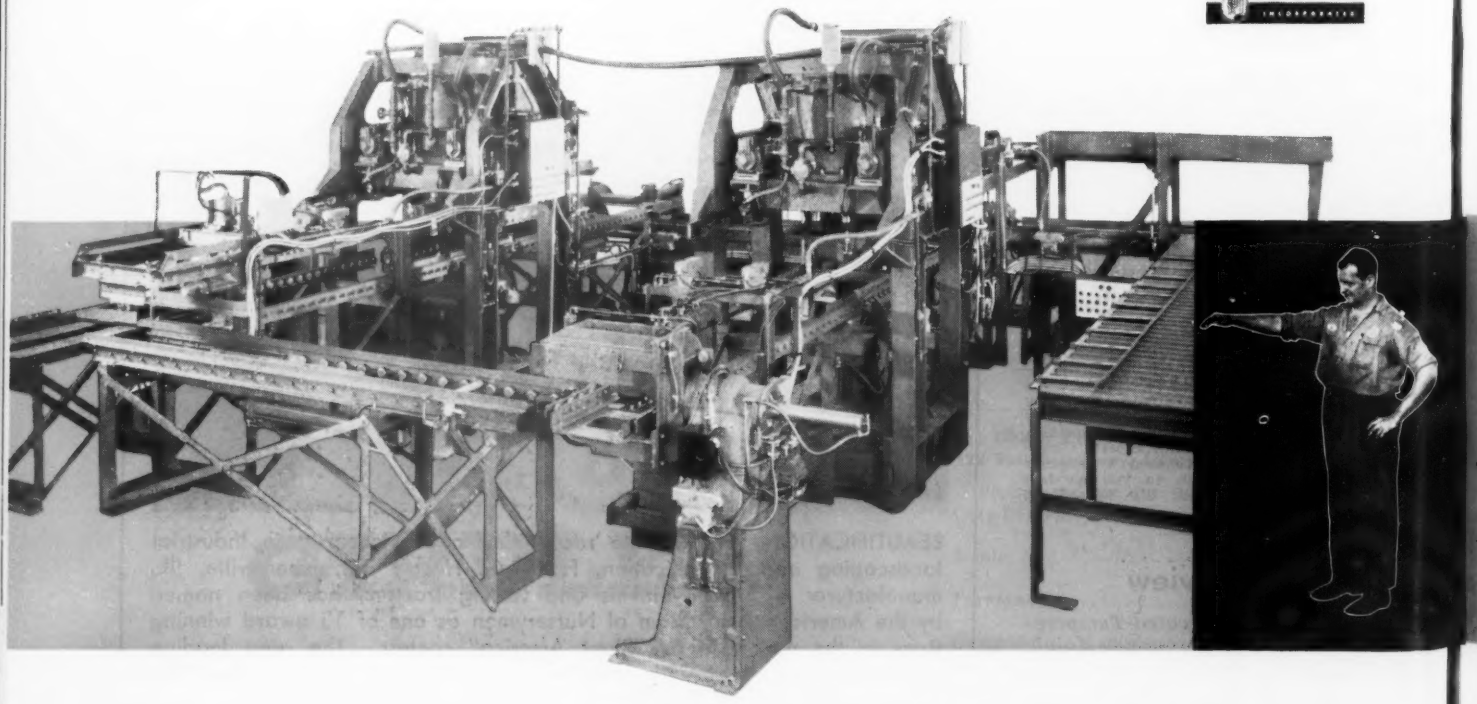
Whether your foundry is ready for automation or a modernization of its existing facilities, SPO builds the molding machines you need for higher production at lower cost.

. . . IF YOU'RE READY FOR COMPLETELY AUTOMATIC MOLDING

As the first practical automatic molding unit, the SPOMATIC has made complete automation possible in the foundry. This unit provides the most efficient, economical and high-speed method of "hands-off" production molding available today. Once a SPOMATIC is started, all operations are fully automatic, mechanical and continuous.

All SPOMATIC installations are engineered to individual production requirements. Capacities of the various integral components can be widely varied. In addition, each machine's versatility is controlled by the flask size specified and the variety of molds possible within that size.

SPOMATIC is the trend-setting molding machine designed to bring automation to foundry operations . . . to make the "foundry of the future" a reality today! Write for Bulletin "MM" for additional details.



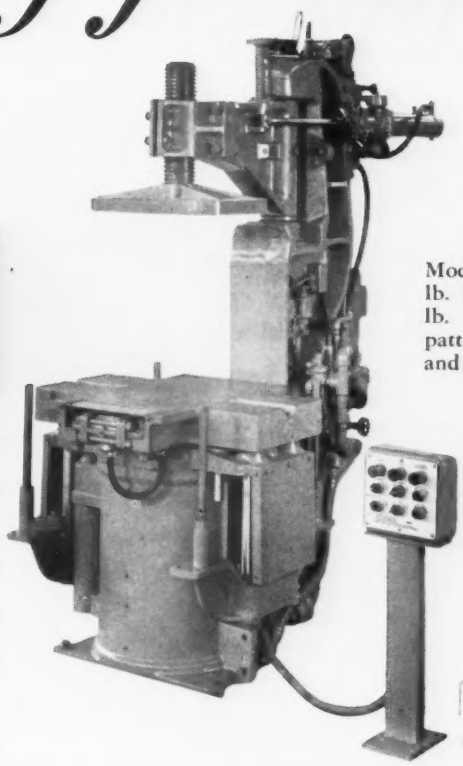
From the smallest to the largest . . . there's a SPO for every molding job

ut the changing foundry

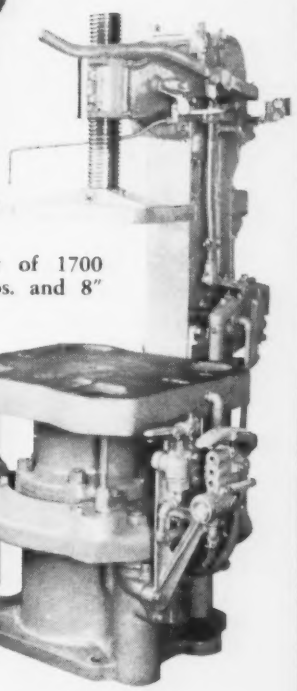
. . . IF YOU'RE GOING TO IMPROVE EXISTING FACILITIES

SPO produces a complete line of molding machines to meet every foundry's needs . . . both for jobbing and mass-production operations. Ranging from small manually-operated units to semi-automatic pushbutton giants, SPO machines are engineered for safe, economical, high speed operation and the production of uniform standard molds. Most of these versatile machines feature the patented "inverted jolt" mechanism, which assures maximum efficiency and service life with minimum maintenance. All SPO units are shipped complete with necessary valves, controls and lubrication fittings. Only an air line need be attached for operation. To meet individual needs, a variety of accessory items also can be supplied for many types of SPO machines.

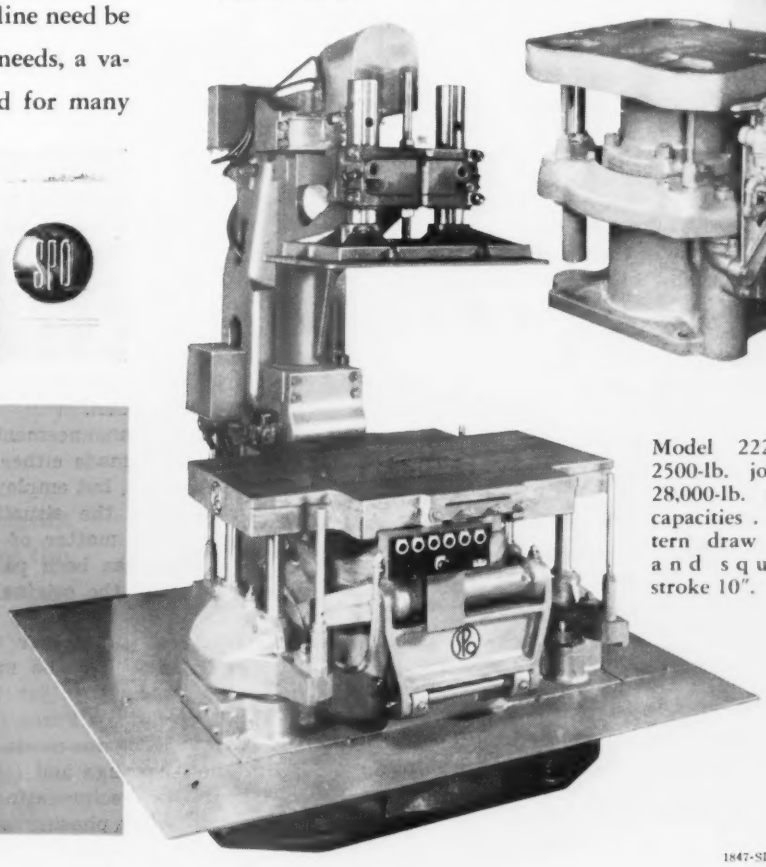
The SPO molding machines illustrated on this page are only a few examples of types and sizes available today. Write for new 8-page bulletin for additional details.



Model 2160-C has 1500-lb. jolt capacity, 16,000-lb. squeeze, adjustable pattern draw (6 to 10") and 12" squeeze stroke.



Model No. 165 has jolt capacity of 1700 lbs., squeeze capacity of 16,000 lbs. and 8" pattern draw.



Model 2222 has 2500-lb. jolt and 28,000-lb. squeeze capacities . . . pattern draw is 12" and squeeze stroke 10".

WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES

1847-SI

SPO INCORPORATED 6449 GRAND DIVISION AVE. • CLEVELAND 25, OHIO

Around the Country

NEWS REPORTS FROM

Chicago
Los Angeles
New York
Detroit
Philadelphia

Los Angeles

FOUNDRYMEN'S reaction to business prospects is mixed. Some iron foundries report a general pick-up in orders since January. For others volume has been slipping since November, with the end not yet in sight. A slight increase in the number of inquiries after the passing of the Mar. 2 inventory tax period has offered some encouragement that potential business is on the increase.

Backlogs are generally low, varying from one to four weeks.

Less foundry capacity is engaged than previously. Iron foundries are generally operating at 65 to 80 per cent of capacity. Activity has been slipping since November and for some foundries the drop has been as much as 10 to 30 per cent. One foundry reports its trend in per cent of capacity as follows: November 95 per cent; December 90 per cent; currently 65 per cent.

Foundry scrap is abundant, with inventories sufficient to support 30-90 days' production.

Offering encouragement to nonferrous foundrymen is the news that West coast aircraft employment exceeds 300,000, a slight increase from a mild post-Korea dip. Douglas Aircraft Co., El Segundo Division, employs more than in World War II and plans to add 5000 workers by the end of 1954. Employment at other aircraft plants is expected to remain high.

New York

THE FIRST quarter is proving to be a disappointment to foundrymen here; not that they expected too much, but what they did expect failed to materialize.

Gray iron shops are averaging around three to four days a week. Backlogs are at as low a point as they have been in months. In few cases do they run more than a couple of weeks.

Operations at the relatively few malleable and steel foundries in this area are better as compared with gray iron shops, and backlogs are a little more extended. Malleable foundries have three to four weeks' work on hand, but they can make surprisingly good deliveries if the occasion demands. Backlogs at the steel shops are four to five weeks, but here, too, quick deliveries can be made if necessary.

These latter foundries are running five days a week, but, far more than other ferrous foundries in the district, are being hurt by the lack of defense work, for the reason they had so much more to begin with, following the Korean outbreak.

Business with the brass and bronze jobbers remains spotty; and as for the captive shops, there is reasonably good activity in requirements for meters and pumps. But maritime needs are very slow and there is not too much going on at the moment in precision instruments. Business of aluminum foundries still is buoyed by aircraft requirements.

Chicago

THE BIG magnesium foundry of Ford Motor Co.'s Aircraft Engine Division, here, will suspend operations by midyear. With the plant swinging into production-line output of the J-57 Pratt & Whitney turbojet engine and winding up the run of the R-4360 Pratt & Whitney reciprocating engine, the requirement for castings no longer justifies keeping the foundry facility in operation.

No formal announcement of the move has been made either by Ford or the Air Force, but employees were acquainted with the situation some time ago. As a matter of fact, the working force has been pared down to a fraction of the original complement.

Decision as to whether the magnesium foundry is to be mothballed or held in standby is yet to be determined by the Air Force.

The turbojet engine needs far fewer magnesium castings and less poundage than the reciprocating engine. Consequently, as phasing out of the reciprocating type power plant progressed, foundry operations were tapered off. As of the beginning of 1953, close to two-thirds of the productive facilities had been idled.

Aside from producing its own requirements for magnesium castings, the foundry had been making castings for several other aircraft users. The Air Force has contracted the latter work out to other foundries and will follow the same procedure for the castings which the Ford Aircraft Engine Division will need in the future.

Philadelphia

WHILE there is little on which to base too much confidence, district foundrymen anticipate a better second quarter than the one now closing. After having revised their expectations for improvement from month to month since the beginning of the year, some are now looking for an upturn in April. Others think that it will not come quite that soon, but are confident that some time during the second quarter business will pick up sufficiently to carry the three-month period higher on an average—despite the fact that business not infrequently sags during the latter half of June.

Gray iron jobbing foundries are averaging close to four days a week. Some estimate production at around 70 per cent of normal. Backlogs run around two weeks. Even some steel foundries are now doing no better than four days, although their backlogs are more extended than those of the gray iron shops.

Operations at malleable foundries have been buoyed a bit by agricultural equipment requirements. However, the most active season for much of this equipment is now nearing an end. Malleable operations are about on a par with the other ferrous divisions. Backlogs lie somewhere between those of the gray

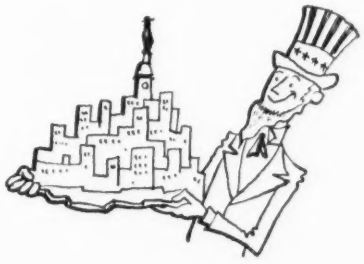
(*Concluded on page* 186)

Time to ~~go back~~ advance to hard selling?

You've been hearing a lot about the need for going *back* to hard selling.

But in this fast moving, intensely competitive year, going *back* to anything is not good enough. Yesterday's methods were geared to yesterday's market.

The 1954 economy is a new model with more than *twice* the power of ten years ago. It's whizzing along at a speed undreamed of by the sales manager of the early forties.



To keep pace with it calls for lifting your sights to the new America that each year is adding the equivalent of another Philadelphia to the population. More competitors in your industry, more capacity to produce, and the rapid launching of new products are making the best of yesterday the obsolete of today.

Such conditions can be met only by *advancing* to a new concept of hard selling. This new hard selling is based on an awareness of a bigger market—and continuing growth. It makes use of the latest market facts to establish sales territories. It relates sales calls to potentials. It applies sales training and sales promotion to step up the salesmen's effectiveness. It makes increasing use of mass communication to raise the productivity of sales calls and reduce sales costs.

Judging by the many requests we have been getting for current data on the metalworking market and its growth, a lot of companies are *advancing* to hard selling. May we be of service to you in supplying market data that will aid your sales planning?

THE **PENTON** PUBLISHING COMPANY

PENTON BUILDING • CLEVELAND 13, OHIO

(*Concluded from page* 184)
iron and steel casting producers.

Good demand from manufacturers of pumps and electrical equipment is cushioning operations at the brass and bronze shops, and offsetting in a measure the pronounced lack of buying by shipyards and manufacturers of maritime equipment. The larger aluminum foundries are still benefiting greatly by needs from the aircraft industry. Some have backlogs extending five to six months. The small aluminum shops, however, are not getting much of this.

FOUNDRY operations in and around the Motor City are up somewhat this month over last month but still behind this time a year ago. Sluggishness in the auto market is cited by most as the principal factor involved.

By the same token, however, recent increases in auto production are being reflected in foundry operations and most observers feel that a strong upsurge will be felt through the spring. Less certain is the outlook over the year, with many concerned that some shops will be unable to stand the return to normal feast-and-famine variations in auto supplier foundry output, which appears imminent.

OBITUARY

MICHAEL J. HOGAN, 59, secretary, Bierman-Everett Foundry Co., Irvington, N. J., died Mar. 10. Mr. Hogan joined the company 36 years ago as a clerk, became manager and later secretary. Active in the New Jersey Foundrymen's Association, he served as its president in 1944-45.

* * *

Frank E. Moore, 76, since 1948 chairman of the board of directors, Mathews Conveyer Co., Ellwood City, Pa., died Feb. 6. Mr. Moore joined the Mathews Gravity Carrier Co. in St. Paul shortly after it was founded in 1905. In 1912, when it was named Mathews Conveyer Co. and was moved to Ellwood City, Mr. Moore became its president.

* * *

Mrs. Anne J. Shofner, owner and president, United Foundry Co., Portland, Oreg., died Feb. 4, as the result of an automobile accident. She acquired the company in 1945. Mrs. Shofner had been associated with Portland foundries since 1919 when she became president-general manager of Shofner Brake Shoe & Iron Foundry upon the retirement of her husband, the late Webb C. Shofner. She sold the business in 1937 and in 1941 organized Shofner Iron & Steel Works, heading that enterprise until it was sold in 1952.

* * *

James A. Bowers, 49, melting superintendent of the American Cast Iron Pipe Co., Birmingham, died Feb.

JAMES A. BOWERS

13. Mr. Bowers spent his entire career with the company, entering its employ as an apprentice patternmaker. He served as patternshop foreman, molder, foreman in the research department, cupola foreman and apprentice supervisor. Active in the Birmingham District Chapter of the AFS, Mr. Bowers was its chairman in 1941, and has presented frequent talks before foundrymen's groups.

* * *

Michael C. Pecsok, 57, since 1945 vice president in charge of sales and marketing, Osborn Mfg. Co., Cleveland, died Mar. 1. A native of Hungary, he came to the United States about 1900. Mr. Pecsok joined the Osborn company in 1912, became a salesman in 1925, and was sales manager from 1940 to 1945.

* * *

Norman F. S. Russell, 74, chairman of the board, U. S. Pipe & Foundry Co., Burlington, N. J., died of a heart attack on Feb. 24. Mr. Russell became associated with U. S. Pipe & Foundry in 1910, was made president in 1923, and chairman of the board in 1948.

Aluminum Foundry Opens

A new permanent mold aluminum casting foundry, Oswego Castings Inc., employing about 85 persons, has been opened recently in Oswego, N. Y.

Combating Noise

(*Continued from page* 113)
was arbitrarily set by our medical department as a level where it was felt it would be desirable to study possible audiometric changes among employees.

If periodic physical examinations are given, the audiometric examination should be made a part of it. However, eventually all employees should be covered by audiometric examinations.

Step III: Job Placement and Transfers—If an employee shows a significant loss of hearing on the recheck, particularly a new employee, he may have a noise-susceptible ear. If so, he should be provided with the best possible hearing protection and sent to a competent otologist for further study.

We cannot find sufficient factual information to justify transferring an individual from a noisy environment to a less noisy one, except in those few instances where the hearing loss is progressing in spite of protective measures. A program of noise abatement also should be considered in order to reduce the overall noise level.

Step IV: Records—The noise level at which the employee works should be entered on his audiometric record. Audiograms should be kept on file by the medical department as a part of the employee's medical record. Sound-level survey and noise-abatement data should be centrally located and available to all parties concerned.

Step V: Audiometer Room—If audiometric examinations are to be conducted on the premises, they should be taken in a room, preferably a part of the first aid facilities. The ideal audiometer room is one where the noise level is 50 decibels or less. It is important, too, that the noise level be fairly constant. If the noise level is high in the room where audiometric testing is done, competent acoustical engineers should be engaged to correct it to assure accurate and consistent audiograms.

From my experience in industry, I know that in many plants it is impossible to construct a testing room with a noise level of less than 50 decibels without the expenditure of large sums of money. According to Allis-Chalmers' medical director, Dr. Paul J. Whitaker, in talks given at a series of clinics on industrial noise and hearing conservation for the

(*Concluded on page* 188)

New straightener automatically adjusts for different size tubes and bars

. . . has 40 TIMKEN® bearings

WHEN you switch from one size bar or tube to another, this new Sutton straightener automatically adjusts its straightening rolls to take the new size. This enables you to switch from 1¼″ O.D. tube to 3¾″ in less than a minute and a half!

Because straightening rolls must withstand heavy radial and thrust loads as the work passes through, they are mounted on Timken® tapered roller bearings. The taper enables the bearing to take both radial and thrust loads. Line contact between rollers and races gives them high load-carrying capacity. The net result is accurate shaft alignment and trouble-free operation.

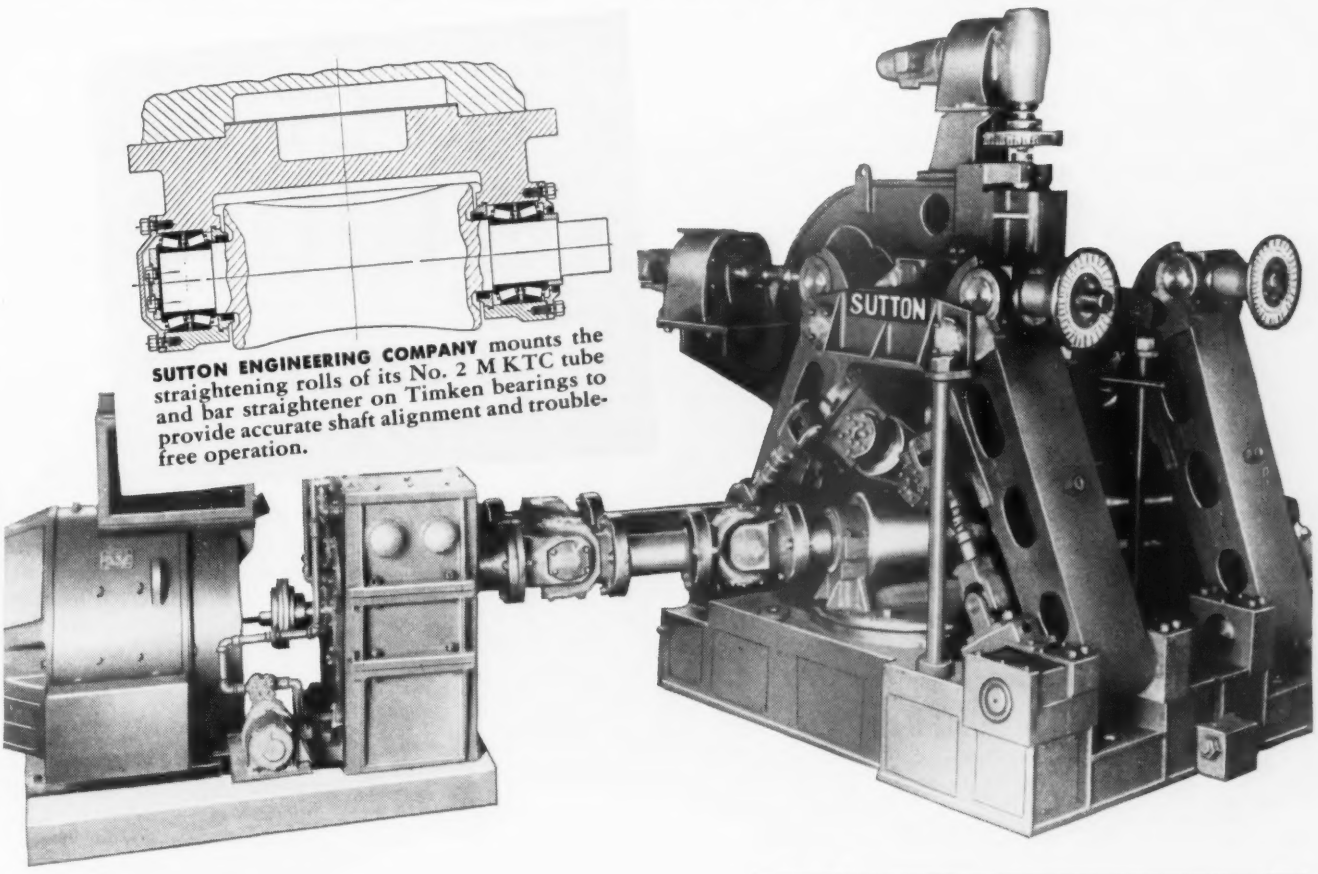
This straightener uses a total of 40 Timken bearings—in the idler rolls, universal joints, and drive unit as well as the driven rolls. Space is at a premium and the compactness of Timken bearings is a big advantage. Their high load-carrying capacity permits a relatively small-size bearing. And no space-taking thrust bearings are required.

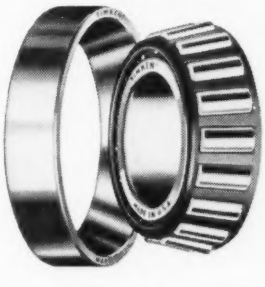
Timken bearings minimize friction because they have true rolling motion and *incredibly* smooth surface finish. This helps provide a smooth-running machine despite the heavy variable loads. It also means longer life and minimum maintenance.

Timken bearings are a sure sign of quality on the machines you buy and the machines you build. Look for the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".

This symbol on a product means its bearings are the best.

SUTTON ENGINEERING COMPANY mounts the straightening rolls of its No. 2 M KTC tube and bar straightener on Timken bearings to provide accurate shaft alignment and trouble-free operation.

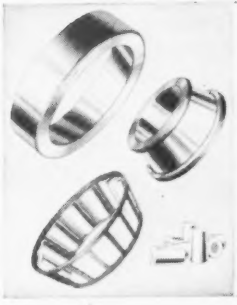




TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS



DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▱ BEARING TAKES RADIAL ◎ AND THRUST ◎ LOADS OR ANY COMBINATION

(*Concluded from page* 186)

Wisconsin Council of Safety, any room can be used for audiometric purposes if the noise level in that room is reasonably constant, has been measured and is such that it does not interfere too much with the audiometric tests in the lower frequencies.

Allis-Chalmers found it practical to train its own audiometer technicians. This training is done by the medical department and briefly is as follows:

A simplified description of what noise is and how it can be measured and evaluated is given. Then, the use of the audiometer and its ramifications are demonstrated. The trainee then is given an opportunity to practice for some time, approximately two to three hours, taking audiograms of various people in the medical department. He is then rechecked by the instructor to see that the audiograms are made in line with the instructions. If satisfactory progress has been made, he is permitted to make audiometric examinations under close supervision of the instructor. In addition, written instructions, explaining in detail each step, are given to each trainee.

Step VI: Noise Abatement — On the recommendation of the health and safety department, the West Allis Works Safety Council, which co-ordinates the health and safety program, appointed a noise abatement committee for each of the firm's four operating divisions.

These committees are made up of members from the maintenance department and from shop supervision. Shop people were selected for these committees because it is felt that it is a shop operating problem. The hygiene section of the health and safety department co-operates with these committees, acting as staff assistants. In this capacity, an educational program on noise was presented to acquaint them with the problem. Sound level readings are taken at their request, and previous noise surveys are evaluated. In addition, the hygiene section catalogs the results of their noise abatement work.

In the absence of noise abatement standards, the committees felt that the logical place to start noise abatement work would be at locations where we had complaints that the area was too noisy. In the limited time that the committees have been functioning, it has been found that a good share of the noise in the shop can be reduced through good maintenance of machines and equipment.

For example, at a number of locations where loose gears and bearings were replaced, the noise level was reduced 8 to 10 decibels. Replacing metal safety guards with wire mesh safety guards reduced a low frequency hum 10 decibels.

On several production operations where compressed air is used to blow chips from recessed parts, we were able to reduce the general noise level as much as 12 decibels by performing the operation in a small cubicle lined with acoustical board.

The largest single expenditure made to date in our noise abatement program is in the tabulating room, where the over-all noise level was lowered an average of 7 decibels through acoustical treatment of the room. It is interesting to note that a similar room had been acoustically treated without producing any change in the over-all noise level. This fact points out that in the absence of competent acoustical engineering, indiscriminate use of acoustical material will not always bring about the desired result.

In one attempt to reduce noise, installing mufflers on the exhaust end of air vises achieved a reduction from 94 decibels to 79. Covering metal bench tops with wood reduced the noise level by as much as 15 decibels on some operations.

At the present time, we are starting to coat tumble barrels and metal skid boxes with a tar compound. We have no idea how much this step will reduce noise, but we are confident that a change will be made.

These measures give some idea of what can be done by a practical approach to noisy operations without spending large sums of money.

In conclusion, it is realized that for operations such as the cleaning of castings, forging and others, noise abatement will be more difficult. As time goes on, we hope to have answers for abating the noise of these operations.

"That's Abe Brown, blast department foreman. He's got the cleanest kids in town!"

Flame Hardening

(*Continued from page* 121)

ductivity is important. These machines present the advantages of exact pyrometric control (especially important when flame hardening gray iron), adaptability, uniformity of results, and speed of performance. Two such machines are illustrated in Figs. 10 and 13.

The machine shown in Fig. 10 is designed for hardening by spinning but also can be adapted to progressive and stationary hardening jobs. Fig. 9 shows this machine in the process of spin hardening camshafts made of alloy gray iron at the rate of one hundred shafts per hour, and Fig. 11 shows the cross section of a hardened camshaft. The machine is equipped with a radiation-type pyrometer which shuts off the flame automatically as soon as the predetermined temperature at the surface of the piece is reached and drops the casting into a quench tank below the spindle assembly. The pyrometer controls the temperature to $\pm 5°$ F and therefore insures greater uniformity than can be obtained by manual operation.[18,19,20,21]

The machine shown in Fig. 13 illustrates the versatility of such equipment. It can be set up for hardening by the spinning method, in which case the casting may be mounted either horizontally or vertically, and it can be used for hardening by the rotary progressive method, the vertical progressive method, or combinations of these methods. This machine is adaptable especially for hardening such parts as gear teeth, shafts, rolls and wheels. Quenching usually is accomplished by a water spray following the heating cycle.[22,23]

Fuel—The fuel most commonly used for flame hardening is acetylene plus oxygen. The advantages of using acetylene as compared with other common fuel gases in conjunction with oxygen is shown in the following comparison of theoretical flame temperatures.[3,57]

Fuel	Ratio, Oxygen to Gas	Theoretical Flame Temperature
Acetylene	1.5:1	5630° F
Propane	4:1	4780° F
Methane	2:1	4950° F
City Gas	Varies	*4900° F

*Approximate

(*Continued on page* 191)

BE SCOTCH!
LINE ALL KINDS OF LADLES
with
IRONTON NOJOINT

You get 4 times the service

...at 2/3 the cost!

With conditions changing fast, you have to keep a sharp eye on foundry costs. One place you may be missing out on real savings is in ladle lining. It's cheaper to put in a good custom-made plastic lining that eliminates joints, is easy to install and repair, and resists slag and metal. That's why ***IRONTON* NOJOINT** is an economy no matter what the operating schedule.

In desulfurizing ladles, for instance, ***IRONTON* NOJOINT** linings make a tremendous difference.

All around the foundry, ***IRONTON* NOJOINT** helps out in hundreds of ways. You can use it to line the cupola spout, to ram the tap hole and slag holes, to patch the cupola, as a lining for hand, bull, holding and transfer ladles, for rammed ladle covers, and for repairs to the burner ports and walls of the annealing oven.

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(*Continued from page* 188)

Temperature—Since martensite can be formed only by heating gray iron above the transformation point and rapidly quenching it, only that portion of the casting which has reached a sufficiently high temperature will be hardened. In flame hardening, only a thin layer at the surface of the casting is so heated. The interior of the casting either remains unaffected or undergoes a slight annealing operation during treatment of the piece.[9]

Since the transformation point of gray iron is affected by composition, it usually is important to know the composition of the casting to be treated. As a general rule, the transformation point (critical temperature) of a casting can be determined by the following formula: Critical temperature in °F = 1346 + 50.4 (% Si) − 45.0 (% Mn).

Avoid Too High Temperature

Thus, for a gray iron containing 2.0 per cent Si and 0.5 per cent Mn, the proper transformation temperature would be approximately 1424° F.[1,4] In this case a flame-hardening temperature of about 1500° F exceeds the transformation temperature and, assuming it has the required combined carbon in the iron, is sufficient to insure an efficient response to the flame-hardening operation. If carbide-forming elements such as chromium or vanadium are present in the iron, somewhat higher temperatures than the usual 1450-1550° F are required.[24]

One should in all cases avoid using too high a temperature. The proper martensitic structure to be obtained in flame hardening was shown in Fig. 14.[24] If the temperature is increased, both plain and alloyed gray iron will form a coarse martensite, such as that shown in Fig. 15.[9] The formation of such coarse martensite at the surface generally is more pronounced in plain gray iron.[25] Such a structure usually is satisfactory in castings where high wear resistance is the principal property desired, but may prove harmful in impact-loaded or locally stressed parts.[9] The presence of coarse martensite also may render the iron susceptible to grinding cracks.[3] If for some reason the gray iron is heated to temperatures approaching its melting point, an undesirable formation of white iron may result (Fig. 16).

Care should be taken to avoid overheating at edges. It frequently is advisable to plug holes with graphite or other heat-resistant materials, so that heat concentration will not cause overheating.[7] In some cases copper shields in holes and at sharp corners have been more effective than plugs of heat-resisting materials.

One difficulty connected with any kind of progressive hardening is illustrated in Fig. 17, which shows the flame hardening of a slowly turning cylindrical casting. The points of equal temperature are connected by lines, called isotherms, in the figure. The shaded portion shows the area heated above the transformation point, the area which may be converted to martensite. As the cylinder is turned counterclockwise, the shaded area is quenched by a jet of coolant and becomes martensite. As the cylinder is again turned, the point B, now hardened, is again heated, this time to below the transformation temperature. Heating to this temperature may soften the martensite to a certain degree and reduce its wear resistance. If this is found undesirable and if the geometry of the piece permits, consideration might be given to heating the entire casting rapidly and uniformly, and then quenching it by total immersion.[25]

Speed of Movement—In the progressive method, the slower the speed of travel of the torch relative to the casting, the longer will be the time for heat to penetrate into the casting and the deeper will be the thickness of the hardened layer.[7] However, progressive speeds in the range of 4 to 7 in. per minute generally produce the best results.

Fig. 18, which shows this relationship between the depth of the hardened layer and the speed of travel of the flame for both alloyed and unalloyed gray iron, demonstrates that unalloyed gray iron requires a slower speed of travel than alloyed iron to produce a hardened layer of equal depth.[10,24]

"Mr. Norman ordered them. They're fenders for his wife's car."

Position of Heating Tip—In order that the surface of the casting may be heated to the flame-hardening temperature in the least possible time, a carefully regulated distance between the heating tip and the work surface must be maintained. It has been found that the highest possible temperature is reached when the surface of the casting is 1/16 and ⅛-in. from the inner cone of the oxy-acetylene flame.[26,57] The distance between the tip and the work surface varies with different tip sizes but usually falls in the range 0.55 to 0.65 in.[9,24] Since it is especially important that the distance between the tip and the surface be kept constant during progessive hardening, care should be taken when hardening by this method to align the casting surfaces so that they are perfectly parallel with the direction of flame travel.[9]

Although the flame is usually directed at an angle of 90 degrees to the work piece, a deviation of as much as 30 degrees from the perpendicular may be made when necessary without any appreciable loss in the effectiveness of the hardening operation.[26] Within these limitations, standard multi-flame hardening tips may be operated horizontally, vertically or in any other position required by the operation.[26]

Flame Adjustments—Velocity of the oxygen-acetylene input is usually regulated at just below the blow-off point. If there is some tendency for the flames to blow off when burning free, they will usually be found to be properly adjusted when impinging on the work piece.[9]

As to the relative consumption of oxygen and acetylene, a neutral flame, one containing an equal mixture of these two gases, has been found satisfactory. However, a slightly oxidizing flame produces a higher temperature, and should be employed by experienced operators.[11,26] There is some tendency, when an oxydizing flame is used on gray iron, for the graphite flakes to burn out, thus producing an unattractive surface. Careful handling by an experienced operator can eliminate this.[9] The acetylene pressure employed naturally depends on a num- of factors, including size and number of the torch or torches employed. Figs. 19 and 20 show the recommended acetylene pressures for two different types of heat treating operations.[9]

Oxygen and Gas Consumption—Consumption of oxygen and acetylene to harden a given area of the surface of a gray iron casting depends on the depth of hardness desired.

(*Continued on page* 196)

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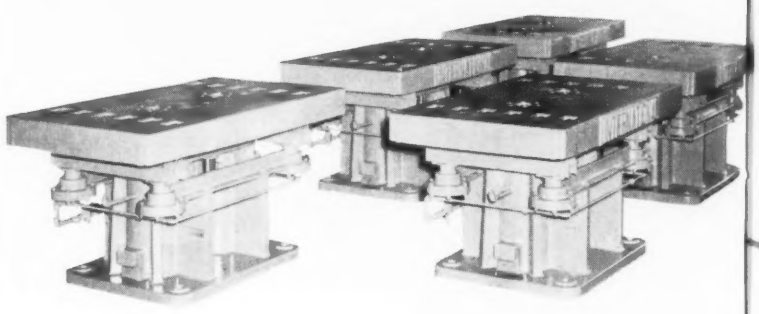

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Tentative Specifications for

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Tentative Specifications for

Magnesium-Base Alloy Sand Castings

ASTM Designation: B 80—53T

Issued, 1930; Revised, 1931, 1934, 1936, 1938, 1940, 1941, 1944, 1945, 1947, 1949, 1951, 1953.

Scope

1. These specifications cover magnesium base alloy sand castings designated as shown in Table 1.[1]

Manufacture

2. The materials used shall be such as to produce products that will conform to the requirements as to chemical composition and physical properties prescribed in these specifications.

Heat Treatment

3. The castings may be subjected to such heat treatment as the manufacturer desires to produce material that will conform to the requirements specified. Heat treatment shall be performed on the whole of a casting, never on a part only, and shall be applied in a manner that will produce the utmost uniformity.

Chemical Composition

4. The castings shall conform to the requirements as to chemical composition prescribed in Table 1.

Sampling for Chemical Analysis

5. (a) The samples for chemical analysis of a melt shall be taken by sawing, drilling, or milling a corresponding casting or tension test specimen in such manner as to be representative of its average cross-section. If preferred, an analysis specimen may be poured from each melt of 2000 lb or fraction thereof. The samples shall weigh not less than 50 g.

(b) The saw, drill, or cutter used for taking the sample shall be thoroughly cleaned. No lubricant shall be used in the operation, and the sawings or metal chips shall be carefully treated with a magnet to remove any particles of iron introduced in taking the sample.

Methods of Chemical Analysis

6. The chemical analysis shall be made in accordance with the Standard Methods for Chemical Analysis of Magnesium and Magnesium-Base Alloys (A. S. T. M. Designation: E 35), or Tentative Photometric Methods for Chemical Analysis of Magnesium and Magnesium-Base Alloys (A.S.T.M. Designation: E-35), or by any other approved methods agreed upon by the manufacturer and the purchaser. The analysis may be made spectrograpically provided that, in case of dispute, the results secured by Standard Methods E-35 shall be the basis for acceptance.

Tensile Properties

7. The tension test specimens representing the castings shall conform to the requirements as to tensile properties prescribed in Table II.

Test Specimens

8. (a) The tension test specimens shall be separately cast in green sand and shall be "cast to size" according to the dimensions shown in Fig. 7 of the Tentative Methods of Tension Testing of Metallic Materials (ASTM Designation: E 8) except that the radii at the ends of the reduced section shall be not less than ½ in. They shall not be machined prior to test except to adapt the grip ends to the holders of the testing machine in such a manner as to assure an axial load.

(b) If any tension test specimen is improperly machined or shows flaws upon testing, it may be discarded and another specimen from the same heat or melt used instead. If no additional specimen is available, the manufacturer and the purchaser shall agree on an alternative procedure.

[1] S.A.E. Specifications Nos. 50 and 500 conform to the requirements of alloys Nos. AZ63A and AZ92A, respectively.

Table I—Chemical Requirements

Alloy*	Mg %	Al %	Mn min. %	Zn %	Rare Earths %	Zr %	Si max. %	Cu max. %	Ni max. %	Other Imp. max. %
AM80A	rem.	7.8–9.2	0.15	0.3 max.	.....	.....	0.3	0.10	0.01	0.3
AM100A	rem.	9.3–10.7	0.10	0.3 max.	.....	.....	0.3	0.10	0.01	0.3
AZ63A	rem.	5.3–6.7	0.15	2.5–3.5	.....	.....	0.3	0.25	0.01	0.3
AZ91C	rem.	8.1–9.3	0.13	0.4–1.0	.....	.....	0.3	0.10	0.01	0.3
AZ92A	rem.	8.3–9.7	0.10	1.6–2.4	.....	.....	0.3	0.25	0.01	0.3
EK30A	rem.	.....	...	0.3 max.	2.5–4.0	0.2 min.	..	0.10	0.01	0.3
EK41A	rem.	.....	...	0.3 max.	3.0–5.0	0.40–1.0	..	0.10	0.01	0.3
EZ33A	rem.	.....	...	2.0–4.0	2.5–4.0	0.50–1.0	..	0.10	0.01	0.3
M1B	rem.	.....	1.20	.....	.....	.....	0.3	0.10	0.01	0.3
ZK51A	rem.	.....	...	3.6–5.5	.....	0.50–1.0	..	0.10	0.01	0.3
ZK61A	rem.	.....	...	5.5–6.5	.....	0.60–1.0	..	0.10	0.01	0.3

* These alloy designations were established in accordance with the Tentative Recommended Practice for codification of Light Metals and Alloys, Cast and Wrought (ASTM Designation: B275).

Note 1.—Analysis shall regularly be made only for the elements specifically mentioned in this table. If, however, the presence of other elements is suspected, or indicated in the course of routine analysis, further analysis shall be made to determine that the total of these other elements is not in excess of the limits specified in the last column of the table.

Note 2.—The following applies to all specified limits in this table: For purposes of acceptance and rejection, an observed value or a calculated value obtained from analysis should be rounded off to the nearest unit in the last right-hand place of figures used in expressing the specified limit.

Table II—Tensile Requirements

Alloy	Condition	Tensile Strength min, psi	Yield Strength† (0.2 per cent offset), min, psi	Elongation in 2 in., min, per cent
AM80A—	F (as cast)	23000	*	3
	T4 (solution heat treated)	34000	*	7
	T6 (solution heat treated and artificially aged)	34000	12000	4
AM100A—	T6 (solution heat treated and artificially aged)	34000	17000	*
AZ63A—	F (as cast)	24000	*	4
	T5 (artificially aged only)	24000	11000	2
	T4 (solution heat treated)	34000	*	7
	T6 (solution heat treated and artificially aged)	34000	16000	3
AZ91C—	F (as cast)	18000	*	4
	T4 (solution heat treated)	34000	*	7
	T6 (solution heat treated and artificially aged)	34000	16000	3
AZ92A—	F (as cast)	20000	*	*
	T5 (artificially aged only)	20000	11000	*
	T4 (solution heat treated)	34000	*	6
	T6 (solution heat treated and artificially aged)	34000	18000	1
EK30A—	T6 (solution heat treated and artificially aged)	18000	14000	1
EK41A—	T5 (artificially aged only)	20000	14000	*
	T6 (solution heat treated and artificially aged)	22000	16000	1
EZ33A—	T5 (artificially)aged only)	18000	14000	1
M1B—	F (as cast)	12000	*	3
ZK51A—	T5 (artificially aged only)	34000	20000	5
ZK61A—	T6 (solution heat treated and artificially aged)	40000	25000	5

* Not required.
† See Explanatory Note 2.

Number of Tests

9. (a) At least one tension test specimen shall be cast from each melt of 2,000 lb or fraction thereof to represent the castings poured from the same melt. If the castings are to be heat treated, the specimens shall be heat treated, with production castings of the same alloy and in the same condition as the specimens. The specimens shall then be tested to judge the ability of their corresponding melts to respond to the type heat treatment to which the specimens were subjected.

(b) Each heat treating furnace charge shall include at least one tension test specimen poured from a production melt. Such specimens shall be of the same alloy and in the same condition as the castings, and shall be tested to judge the quality of the heat treating operation given the furnace charge.

Method of Testing

10. The tension tests shall be made in accordance with the Tentative Methods of Tension Testing of Metallic Materials (A.S.T.M. Designation: E 8).

Note.—The values obtained for the tensile properties covered by these specifications are not seriously affected by variations in speed of testing. A considerable range of testing speed is permissible; however, the rate of stressing to the yield strength should not exceed 100,000 psi per min. and above the yield strength the movement per minute of the head under load should not exceed 0.5 in. per in. of gage length (or distance between grips for specimens not having reduced sections). Care must be exercised, especially when making yield strength determinations, that the speed of testing does not exceed the ability of the strain- and load-indicating equipment to function satisfactorily.

Workmanship and Finish

11. The castings shall be of uniform quality and condition, free from cracks or other injurious defects, and shall be well cleaned before inspection by sandblasting or any other approved process.

Inspection

12. (a) Inspection may be made at the manufacturer's works where the castings are made, or at the point at which they are received, at the option of the purchaser.

(b) If the purchaser elects to have the inspection made at the manufacturer's works, the manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with these specifications. All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection

13. Castings that fail to conform to these specifications or that show injurious defects revealed by machining operations subsequent to acceptance may be rejected and, if rejected, the manufacturer's responsibility shall be limited to replacing the rejected material without charge to the purchaser. The full weight of the original material rejected shall be returned to the manufacturer.

Explanatory Notes

NOTE 1: Alloy AM80A.—This alloy has a specific gravity of about 1.80. It is used in the ascast, heat-treated, and heat-treated and aged conditions. This alloy will produce castings having the maximum soundness with moderate mechanical properties.

Alloy AM100A.—This alloy has a specific gravity of about 1.81. It is used both in the solution heat-treated condition and in the solution heat-treated and aged conditions. Aging increases the yield strength and hardness and decreases the toughness and elongation.

Alloy AZ63A.—This alloy has a specific gravity of about 1.84. It is used in the ascast, the solution heat-treated, and the solution heat-treated and aged conditions. Its properties are somewhat better and its resistance to salt-water (NaCl) corrosion is decidedly better than in the case of alloy AM100A.

Alloy AZ91C.—This alloy has a specific gravity of about 1.81. It should be used for those applications requiring the maximum of strength and hardness as well as ductility. Its mechanical properties in the heat treated and in the heat treated and aged temper are similar to AZ63A, but its Foundry characteristics are similar to AZ92A. It should be used in preference to AZ63A if the higher resistance to salt water (NaCl) corrosion of the latter composition is not required.

Alloy AZ92A.—This alloy has a specific gravity of about 1.82. It is used where good soundness and mechanical properties are required. The alloy is heat treatable and is then characterized by high strength and hardness. Its resistance to salt-water (NaCl) corrosion is approximately equivalent to that of alloy AZ63A.

Alloy AZ92A in the heat-treated condition ages more rapidly than alloy AZ63A in the heat-treated condition. Under service conditions where the castings attain a temperature of 200 F. or higher, the castings of alloy AZ92A, heat-treated, will gradually change to the heat-treated and aged condition.

Alloy EK30A.—This alloy has a specific gravity of about 1.79. It is used in the heat treated and aged condition. It is recommended for use at elevated temperatures, especially in the range of 300 to 500 F. This alloy will produce sound castings for pressure tightness.

Alloy EK41A.—This alloy has a specific gravity of about 1.81. It is used in the heat treated and aged and artificially aged conditions. It is recommended for use at elevated temperatures, especially in the range 300 to 550 F. This alloy will produce sound castings for pressure tightness.

Alloy EZ33A.—This alloy has a specific gravity of about 1.84. It is used in the artificially aged condition. It is recommended for use at elevated temperatures, especially in the range of 300 to 500 F. This alloy will produce castings for pressure tightness.

Alloy M1B.—This alloy has a specific gravity of about 1.76. It is used principally for aircraft tank fittings where a weldable alloy with high resistance to salt-water (NaCl) corrosion is required.

Alloy ZK51A.—This alloy has a specific gravity of about 1.83. It is used in the artificially aged condition. This alloy produces castings combining a high yield strength with good elongation.

Alloy ZK61A.—This alloy has a specific gravity of about 1.83. It is used in the solution heat treated and artificially aged condition. This alloy produces castings of highest strength-to-weight ratio and good elongation.

NOTE 2.—The yield strength of magnesium base alloys is defined as the stress at which the stress-strain curve deviates 0.2 per cent from the modulus line. It may be determined by the "Offset Method" or the "Extension Under Load Method" (the latter is often referred to as the "Approximate Method Without the Stress-Strain Diagram") as described in the Tentative Methods of Tension Testing of Metallic Materials (A.S.T.M. Designation: E 8).

The data in Table III give typical and minimum yield strength values for the various alloys, together with the corresponding unit deformation for use with the "Extension Under Load Method" based on a modulus of elasticity, E = 6,500,000 psi.

Table III—Explanatory Notes

Alloy	Condition	Typical or Minimum	Yield Strength (0.2 per cent offset), min, psi	Unit Deformation, inch per inch of gage length
AM80A—	T6 (solution heat treated and artificially aged)	minimum	12000	0.0038
AM100A—	T6 (solution heat treated	typical	19000	0.0049
	and artificially aged)	minimum	17000	0.0046
AZ63A—	F (as cast)	typical	11000	0.0037
	T5 (artificially aged only)	typical	15000	0.0043
	T4 (solution heat treated)	typical	11000	0.0037
	T6 (solution heat treated	typical	19000	0.0049
	and artificially aged)	minimum	16000	0.0045
AZ91C—	F (as cast)	typical	11000	0.0037
	T4 (solution heat treated)	typical	11000	0.0037
	T6 (solution heat treated	typical	19000	0.0049
	and artificially aged)	minimum	16000	0.0045
AZ92A—	F (as cast)	typical	14000	0.0042
	T5 (artificially aged only)	typical	17000	0.0046
	T4 (solution heat treated)	typical	14000	0.0042
	T6 (solution heat treated	typical	20000	0.0051
	and artificially aged)	minimum	18000	0.0048
EK30A—	T6 (solution heat treated and artificially aged)	minimum	14000	0.0042
	T5 (artificially aged only)	minimum	14000	0.0042
EK41A—	T6 (solution heat treated and artificially aged)	minimum	16000	0.0045
EZ33A—	T5 (artificially aged only)	minimum	14000	0.0042
M1B—	F (as cast)	typical	4000	0.0026
ZK51A—	T5 (artificially aged only)	minimum	20000	0.0051
	T6 (solution heat treated and artificially aged)	minimum	25000	0.0058
ZK61A—	T6 (solution heat treated and artificially aged)	typical	28000	0.0063

Additional copies of this specification may be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, for a nominal sum.

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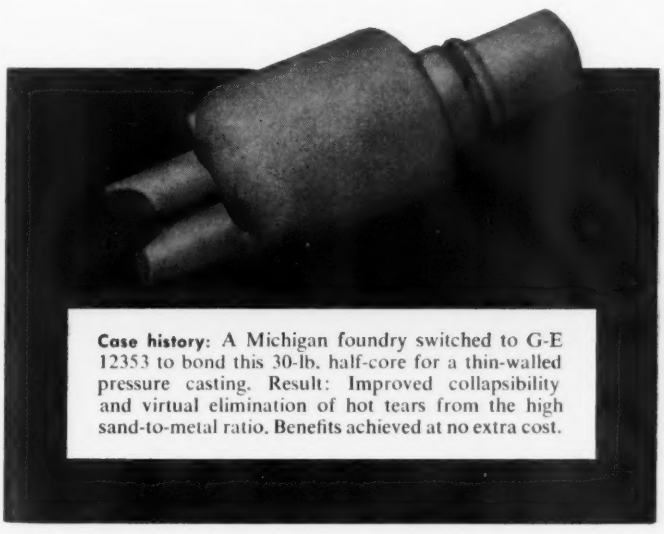

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(*Continued from page* 191)

A few typical figures are shown in Table III, based on an oxygen-to-acetylene ratio of 1.1 to 1.0.[27]

These results are based on a torch with a 4-in. tip. If a 3-in. tip is to be used, about 10 per cent should be added to the gas consumption; 15 per cent should be added for a 2-in. tip and 20 per cent for a 1-in. tip.

Quenching—To form a hard layer of martensite, the casting, once it is heated by the flame, must be cooled rapidly to the point of martensitic formation, generally from 200 to 400° F. This quenching usually is accomplished by a water spray issuing from holes drilled into a water distribution chamber in the heating head, often referred to as "tip." The water spray is directed at an angle of 10 to 20 degrees from the perpendicular and strikes the casting behind the flame, the greater distance within this range being used with alloy irons.[3]

Spray Velocity Important

Regulation of the water spray also is important. If the velocity of the spray is too great, the water will tend to bounce off the surface. The usual water spray pressures are between 60 and 100 psi. If it is necessary to flame harden with the flame impinging upward on the surface of a casting, auxiliary quenching tips generally must be supplied to promote maximum hardening.[26,27,28]

When castings of relatively thin cross sections are to be hardened by the progressive method, an auxiliary jet sometimes is installed which projects a water spray in front of the flame. This "fore quench," which limits the extent of the heated area to the zones between the two jets, tends to minimize distortion during heat treatment. A copper shield sometimes is installed behind the leading spray to prevent its interference with the flame.[3,26]

Although water is the usual quenching medium, in some cases where cracking or distortion may occur a less drastic quench may be employed. Since oil is too inflammable to be used as a spray near a flame, a soluble cutting oil, similar to that used in high-speed machining operations, containing about 6 per cent oil, may be used. A useful compromise is to spray the heated part with water at 90-110° F. Water at this temperature has almost the same cooling effect as oil.[60] Some high-alloy irons may even be quenched in a stream of air.[29]

In certain flame-hardening operations, such as spinning, the entire heated piece is immersed in the quenching medium. If water is used, the severity of the quenching effect to some extent can be regulated by agitation of the water bath; however, an oil bath is more commonly employed.

When single flat surfaces are to be flame hardened, quenching may be accomplished by immersing the entire casting in water or soluble oil within ½-in. of the surface to be hardened. Heat is extracted from the heated area by the cooled body of the casting at a sufficient rate to promote formation of martensite (Fig. 21).[9] The same principle is involved in the process known as "spot hardening." When it is necessary to harden only certain spots on the surface of a large casting, these small areas may be heated briefly by a torch; when the torch is removed, rapid dissipation of heat to the body of the casting is sufficient to harden the desired spots.[30]

Control of Defects—As a rule, distortion induced by flame hardening of gray iron is relatively small.[8,31]

Nevertheless, under certain conditions distortion may occur. Such distortion usually can be eliminated by avoiding unnecessarily high temperatures of treatment, or by avoiding unnecessary depth of the hardened layer.[1,10] Partial immersion of the casting, as shown in Fig. 21, has been found to reduce distortion.[10] In the case of long, flat castings, flame hardening on both sides will compensate for any distortion that may have resulted from flame hardening on one side only.[32]

If distortion is caused by internal stresses induced during the casting process, short stress relief anneal at low temperatures, (800-900° F) may be advisable, especially in the case of castings of intricate design.[1,7,31]

"Harold! Someone stole my antique pewter!"

Spalling: Spalling, that is the breaking off of the hardened layer from the body of the part, is very seldom a problem. In one typical case that of the flame-hardened gray iron latheway shown in Figs. 22 and 23 specimens taken from the casting were bent and subjected to impact; in all cases, failure of the material occurred before spalling of the hardened zone.[1,33] This readily can be corrected by adjusting the composition of the material and by the application of a less drastic quench.

Edges and Holes: Holes and edges show a tendency to heat more rapidly than the rest of the casting because the dissipation of heat into the body of the casting is less rapid near such points. An increase in the speed of travel of the flame relative to the casting should eliminate any undesirable effects which may occur because of this overheating. In some cases copper or graphite shields or plugs are installed at the edges or holes of the castings.[8]

After Treatments—Whenever possible or economically feasible, a stress-relief treatment should be applied by heating in a furnace or in hot oil or by passing a flame over the surface. Such a treatment will minimize the danger of distortion or cracking and will increase the toughness of the hardened layer. Temperatures of between 300 and 400° F usually are sufficient. In one case, a stress-relief anneal at 300° F for 7 hr was found to remove 25-40 per cent of the residual stresses in a flame-hardened casting, while reducing the hardness of the surface by only two to five points on the Rockwell A scale.[3,10,24] Although this after treatment is desirable, it should be stressed that, in contrast to other ferrous materials, it often can be safely omitted in the case of gray iron. For example, preheating a cast iron gear before it is heated on the periphery for hardening would put the whole exterior surface in beneficial compressive stress whereas heating only the periphery might cause the external shell to be in tension.[56]

Hardness—Fig. 24 shows schematically the distribution of brinell hardness at the surface of a flame-hardened gray iron.[28] Although the maximum theoretical hardness seldom is attained, it will be recalled that hardnesses between 450 and 550 brinell may be produced in gray iron castings consistently.

In addition to obtaining the proper temperature, the depth of the hardened layer and its microstructure is dependent on two other factors; First,

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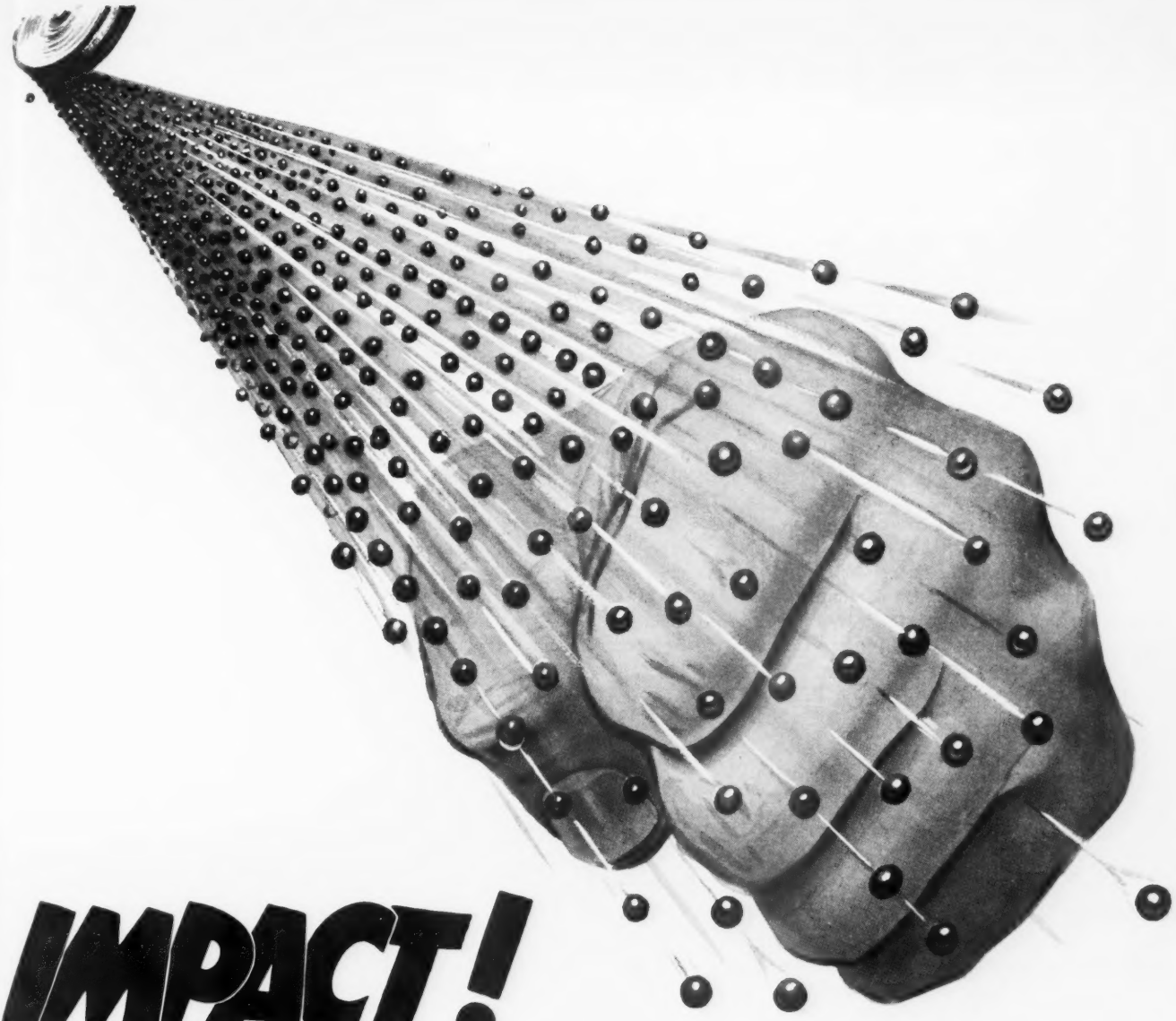

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*U. S. Patent #2184926
(other patents pending)

(*Concluded from page* 196)

the amount of carbon and alloys in solution when the flame-hardened surface is qeunched; second, the efficiency with which heat is extracted from the surface that had been heated by the flame. It is assumed that, in the absence of alloys, a close-grained iron not too high in carbon or silicon has been selected. A very high-carbon, high-silicon open-grained iron, will, of course, not respond efficiently to a hardening operation.[34]

An interesting comparison of the ability to flame harden various plain and alloy irons has already been shown in Fig. 1 and accompanying tables. A further example in terms of brinell hardness rather than Rockwell-C is shown in Table IV.[24]

It will be noted in this latter table and from Fig 27 that the surface tends to have a somewhat lower hardness than a layer immediately below the hardened surface. This phenomenon does not adversely affect wear resistance, and it has been reported that the hardness of the surface often can be raised by heating to 380-480° F.[56]

Wear Resistance Differs

In considering the actual significance of the brinell hardness of 450 to 550 as exhibited by most gray irons, it should be noted that, gray iron with a hardness of 450 brinell will exceed in wear resistance a high-carbon or tool steel exhibiting a brinell hardness of 600.[35]

It also has been found that in lubricated wear tests, the groundmass of a flame-hardened gray iron, interrupted as it is with graphite flakes, is about 300 per cent as efficient in retaining an oil film as similar steel surfaces.[36]

Fatigue Properties—As previously stated, the fatigue strength usually is increased by surface hardening. There is, likewise, some evidence available that the compressive stresses remain in the flame hardened layer, with a resultant beneficial effect on fatigue strength.[58] An example is the fillet area in crankshafts in which high compressive stresses, over 30,000 psi, can be induced by flame or induction heating followed by water quenching. It has been reported that the favorable fatigue strength possible with surface hardening cannot be produced by conventional methods through hardening.[56,58,59]

Any possible tensile stresses would further be offset considerably by both expansion occurring at the transformation point and the fact that the presence of graphite flakes and the lower modulus of elasticity of gray iron both act to prevent serious build-up in internal stresses.[37]

Applications—The applications already made of flame-hardened gray iron are of great interest and commercial value. Probably the largest field is that of hardening the ways and other parts of machine tools exposed to excessive wear. The hardening, either by flame hardening or the induction method, almost always is done by the progressive method which already has been described and illustrated in Figs. 22 and 23.[32]

Another large field for flame hardening is its application to camshafts.[38] One hardening operation for camshafts already has been shown in Fig. 9. Another method, in which only the lobes and fuel-pump eccentric of this shaft are hardened, requires a special set-up, illustrated in Figs 29 and 30. Fig. 31 illustrates the character of the hardened layer obtained on such camshafts.

A third field for flame hardening is the hardening of gray iron dies used in forming sheet metal parts in the automotive industry.[39] The leading edges and parts of the die subjected to severe wear are locally flame hardened. There also is an increasing tendency to flame harden cast iron rolls; a gray iron roller shell in process of hardening is shown in Fig. 25. Finally, the other most frequent use of flame-hardened gray iron is for gears such as those shown in Fig. 26. Fig. 28 shows a group of flame hardened parts.

A survey of members of the Gray Iron Founders' Society as concerns their application of flame hardening to gray iron found that flame hardening was being employed regularly on gray iron parts for many other uses: Automotive machinery, bearing housings, burners for hotwater heaters, compressors, consumer gas regulators, diesel engines, high pressure valves, knitting machinery, machine tools, printing presses and textile machines.

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Sources of Illustrations

Fig. 1—Climax Molybdenum Co.
Figs. 2, 4, 5, 6—Air Reduction Sales Co.
Figs. 3, 8—R. K. LeBlond Machine Tool Co.
Figs. 7, 12, 14, 15, 16, 26—Linde Air Products Co.
Figs. 9, 10—Cincinnati Milling Machine Co.
Figs. 11, 29, 30, 31—Ford Motor Co.
Figs. 13, 28—General Iron Works Co.
Fig. 17—From bibliographic reference 25.
Fig. 18—From reference 10.
Figs. 19, 20, 21—From reference 9.
Figs. 22, 23—Monarch Machine Tool Co.
Fig. 24—From reference 28.
Fig. 25—*Iron and Steel* and Flame Hardeners Ltd., Sheffield, England.
Fig. 27—From reference 24.

Huge Auto Body Dies for Tight Detroit Schedules Rammed in Half the Time with a B&P MOTIVE SPEEDSLINGER

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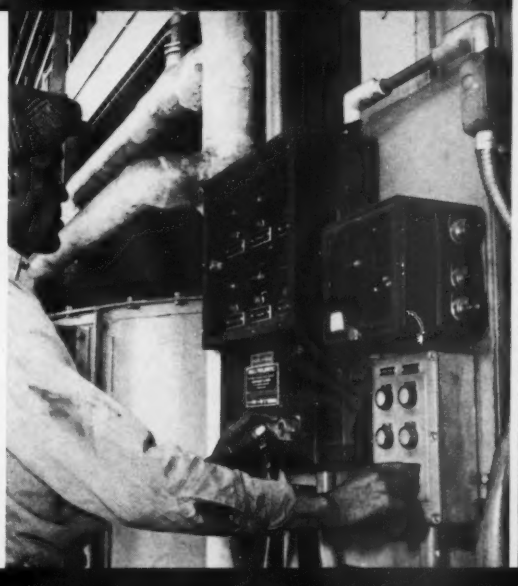
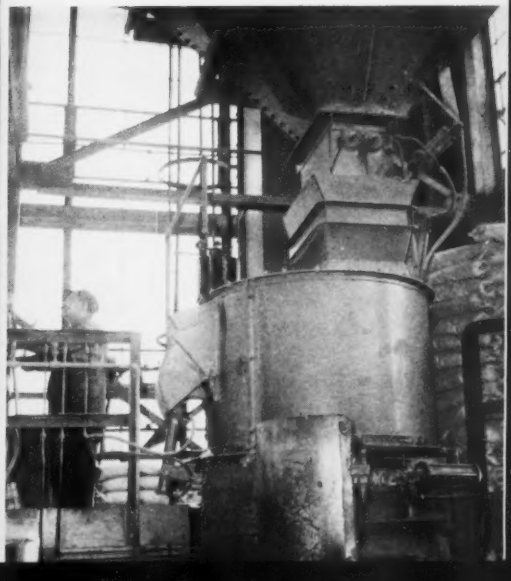
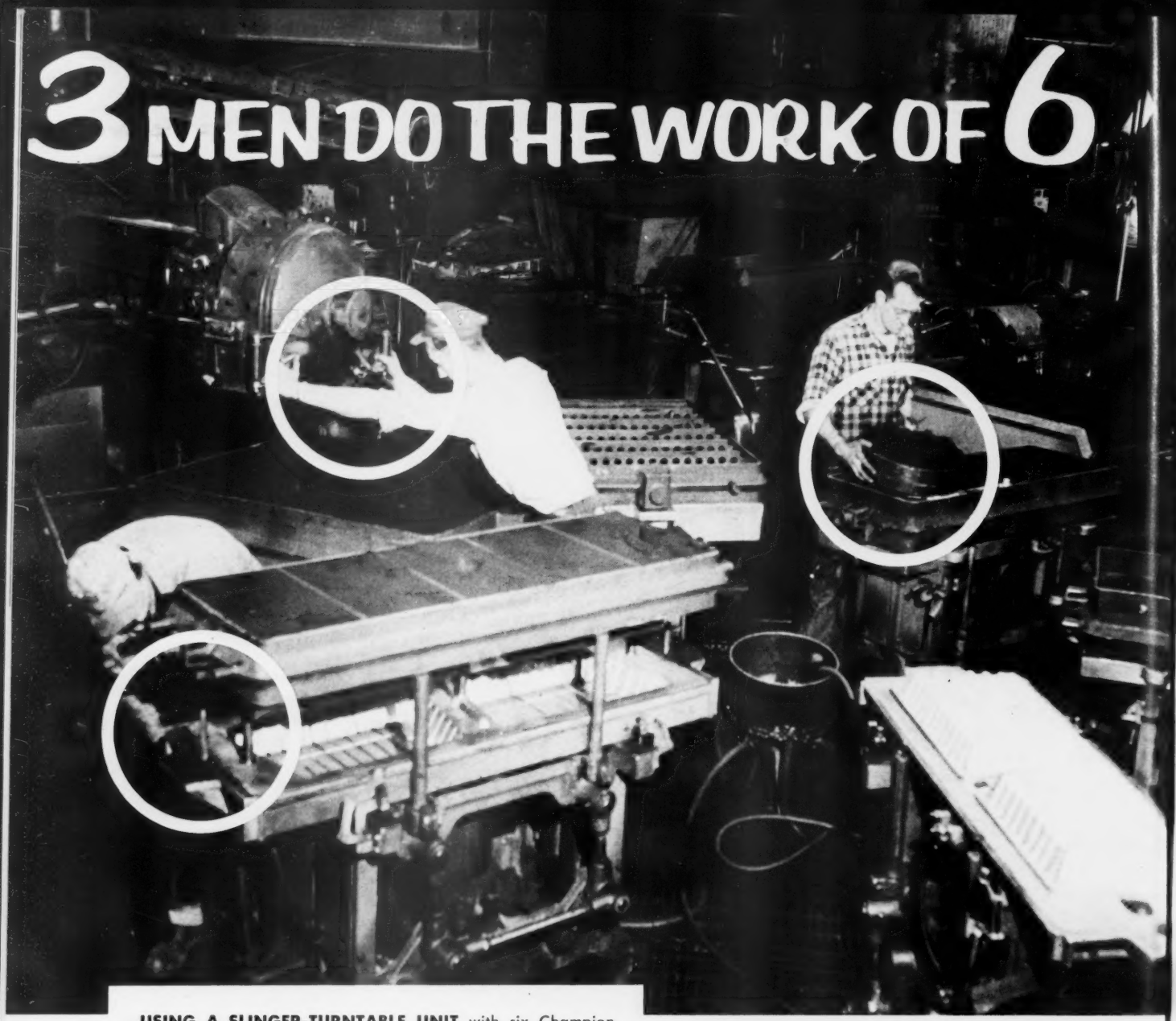




LEFT PHOTO Skiptrol and Mulltrolmatic control units. The Skiptrol controls the loading of the Skiphoist bucket. Mulltrolmatic times and controls all phases of the mulling cycle. The complete mulling cycle requires only 1½ minutes.

RIGHT PHOTO A B&P Model "50" Speedmullor mulls all of Central's core sand. For this exacting work sand mixtures must be perfect, and top capacity is essential.

3 MEN DO THE WORK OF 6



USING A SLINGER-TURNTABLE UNIT with six Champion Speed-Draw Machines three men ram 160 large molds on each shift at the Bennett-Ireland foundry at Norwich, N.Y. Cope and drag patterns for three different jobs are run at one time and jobs may be changed in a few moments without interrupting production.

Six Champion Speed-Draw Machines on a 16-foot turntable—the equivalent of six cope and drag molding stations—are served by a single Stationary Sandslinger supplied with Speedmullor mulled molding sand by a B&P Rotofeed. The equipment is highly flexible . . . three different jobs are run at one time . . . patterns may be changed without interrupting production . . . and the unit may be operated at capacity or at part-capacity with equally high man-hour efficiency. If you operate a jobbing foundry, information on these units will help you. Write to *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Ave., Chicago 39.*

AN '80' SPEEDMULLOR thoroughly mulls all of the molding sand for Bennett-Ireland's molding operations including that for the Stationary Sandslinger. Return sand is delivered to the mullor hot and is thoroughly cooled during the 1½ minute total mulling and cooling cycle. Another Speedmullor —a '40'—thoroughly mulls all of the foundry's core sand.

LOOK TO
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Man-to-Man

(*Concluded from page* 156)

beings are always the biggest factor in the design of any piece of apparatus, no matter how scientific. He'd go on, "Didja ever think what houses would be like if people were 12 ft tall? They'd be twice as big. And if people's knees bent the other way, you'd hardly recognize a chair." The biggest factor in the design of a cupola is the people who tend it, their limitations and peculiarities.

Some day we'll have to write a book or something to show that practically every law of physics has its equivalent or counterpart in humanics—inertia, resistance conductivity, malleability, boiling point, flash point, tensility, impedance, inductance, reluctance, hysterisis—and with just as much reason behind these human manifestations as their physical brothers under the skin.

Yes, sir! Now I begin to see why philosophy covers the water front and removes the artificial barriers we ignorantly have built up to separate the factors involved in our work and satisfactions. I'm glad I face my ignorance of the meaning of philosophy with the dictionary. I've lettered an 8 x 10 in. card with the definition and tacked it on the closet door facing my desk.

Never again will I cringe when someone calls me a philosopher. In fact I'll sort of romp all over the field of foundry practices with philosophies of ladle lining, cupola tending, coremaking, patternmaking, gating and risering, in the confident belief that these philosophies will take into account all of the realities involved, both human and otherwise.

Foundry Training Center To Open in India

As a result of the work of John F. Schnur during the past two years in offering assistance to foundries in India (FOUNDRY, Sept. 1953, pp. 154-155), a demand has developed to improve techniques of the Indian foundry industry.

To meet this demand, the Ministry of Commerce and Industry, Government of India, through the Point IV program, has secured Mr. Schnur's services to August, 1955, and will establish under his direction a foundrymen's training center at the Indian Institute of Technology, Kharagpur, Eastern Railway.

Certain equipment and other facilities will be offered by the U. S. Technical Co-operation Mission and the laboratories and industrial research staff of the Armour Research Foundation, Illinois Institute of Technology, will be made available to this project.

The center will organize and undertake short courses in modern foundry practice to develop greater technical skill in the ranks of foremen and supervisors. Each complete course will be of five months' duration and five such courses are planned.

Courses include: Melting practice, floor molding in two-part boxes, snap flask molding, machine molding, sand practice, sand testing, coremaking and drying, modern methods of wood and metal patternmaking for floor and machine molding and others.

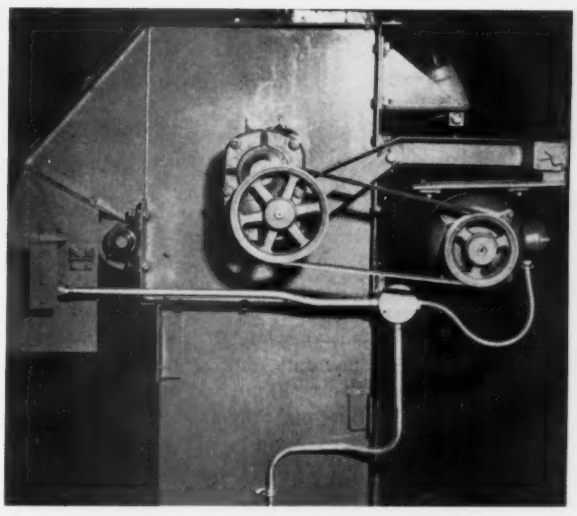
How To Do It . .

Automatic Take-Up and Aligning Device Protects Elevator Belts

By R. J. BELL
Vice President and General Manager
Newaygo Engineering Co.
Newaygo, Mich.

AUTOMATIC elevator belt take-up and head shaft alignment mechanism uses pivoted mountings to achieve constant tension on both the driving V-belt and the elevator belt. As shown in the accompanying illustration, framework of the device consists of two angle iron, broad V-shaped legs, one at each side of the elevator housing. These are pivoted at the back of the housing. They support the elevator belt drive pulley shaft at one end and have a cross bar between the other ends behind the back of the elevator. Attached to this cross shaft is a pivoted base on which is mounted the motor and drive sheave. The shaft is at 90 degrees to the elevator casing, and, therefore, automatically maintains positive horizontal alignment of the elevator drive pulley shaft with relation to the casing at all times.

Weight of the motor on the pivoted frame helps to maintain constant elevator belt tension, compensating for expansion and contraction of the belt due to stretching, heat and cold. However, the major



tension adjustment is achieved by actuating the pivoted base through a diaphragm air cylinder shown at upper right in the illustration. Within the air cylinder is sufficient air cushion under pressure to compensate for any out-of-round at the elevator head pulley or anything that might cause a sudden stretching of the belt. The possibility of damage to the belt thereby is reduced and belt life increased.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

TIME SAVERS
in the Nonferrous Foundry

By C. GOLDBERG
Chief Chemist
New England Smelting Works Inc.
West Springfield, Mass.

Much work in the laboratory is time consuming. Here are some suggestions that will enable the technician to take short cuts with resultant saving in time and greater productive results

SOMEONE has truly said that the most frequently sought reagent in the average control laboratory is time. Merely the large number of samples to be run makes that necessary, while the desirability of fast analyses because the metal being held in the pot or furnace may change in composition during analysis, makes the situation that much more difficult.

When some percentage of scrap is used in melts to produce red and white metal alloys the number of analyses to be made increases because each lot of scrap must be carefully analyzed before figuring the charge and because the presence or absence of an undesirable element or elements in the scrap must be determined. Qualitative analysis, then, becomes important in the laboratory and the use of spot tests, differentiation by physical characteristics and plain common sense backed by experience are all employed.

For instance, the question arises whether a metal having silvery luster is Monel metal (roughly 65 per cent Ni, 35 per cent Cu) or nickel silver (10-25 per cent Ni, about 60 per cent Cu). Most of the metals of the Monel group are slightly magnetic at room temperature, but all are not; the nickel silvers are not magnetic. A decision cannot be made, then, from that property alone. Or the metal in question may be brass or copper that has been nickel plated.

Develops Simple Test—Solution of the metal in 50 per cent nitric acid for a moment will dissolve the nickel plating, if present, and the third possibility mentioned above is confirmed or eliminated by examination of the undissolved sample for brass or copper color. To solve the question the author has devised a simple qualitative test.[1] The test requires about five minutes, whereas quantitative analysis of the alloy for copper and nickel requires not less than 1 hr. If the test shows the sample to be one of the nickel silvers and only the approximate nickel content is needed, a rapid colorimetric method[2] may be used, the copper not having to be removed from the sample being tested before the nickel is determined.

The instance given above may be supplemented by another. Is the sample a high-lead bronze of the 80-10-10 group or a railroad bronze having more lead and less tin? Solution of the sample in nitric acid precipitates the tin as stannic oxide. To avoid filtration of the oxide the weighed sample (0.5 gram) may be dissolved with 0.5 ml of 48 per cent hydrofluoric acid plus the nitric acid, in a Vycor or other fluoride-resistant beaker. The tin is complexed by the fluoric acid as a soluble material and the sample is then diluted with distilled water and electrolyzed for copper and lead.

While the electrolysis is proceeding the tin is separately determined by the volumetric method of Kinnunen and Merikanto.[3] Within thirty minutes one may have the determination of the three elements. The classical procedure involves digestion of the sample in nitric acid for an hour so the stannic oxide may be quantitatively precipitated, filtration, burning down of the precipitate and electrolysis of the filtrate for copper and lead. The accuracy of the quicker method is lower but is sufficient to identify the alloy. Thus, use of separate samples and of known methods sufficiently accurate for some control work, saves time.

Color Tests Are Simple—The use of colorimetric methods, wherever their accuracy is comparable to the slower gravimetric methods, is to be recommended. Aluminum or beryllium may be determined in their red metal alloys without prior removal of copper by a reliable colorimetric method[4] and without tedious filtration of the gelatinous precipitate of aluminum or beryllium. Another facet of the use of colorimetric methods in the nonferrous control laboratory is the possibility of measuring the color of one element in the presence of another color-forming element when the latter is present in small percentage. Nickel, for instance, may be determined directly in aluminum alloys when the copper content is within a certain range and the accuracy of the nickel determination is good. Measurements of turbidity, using the ordinary colorimeter, may be convenient in some cases where high accuracy is unnecessary. Sulphur as barium sulfate or silver as the chloride are determinable in that fashion within a certain range with an accuracy of 85 per cent if all conditions are rigidly followed.

Semiquantitative comparisons may be of value under certain conditions. When it is desired to ascertain the percentage of copper in soft solders the samples may be dissolved in nitric acid plus a tin-complexing reagent (citric acid, for example) and ammonia added to yield the deep blue cupric ammonium complex. Comparisons of the color produced with sample solders having a known copper content, treated in exactly the same manner, will often suffice to gage roughly the amount of copper. However, if less than 0.3 mg of copper is present in a 1.0-gram sample it is best to make comparisons using p-dimethylaminobenzylidene-rhodadine, a reagent giving a deep color with cuprous copper.

Use of Spot Tests—Spot testing is valuable. Zinc, for instance, may be distinguished from zinc die-casting alloys, containing aluminum and copper, by placing a few chips in the depression of a white spot plate and adding a drop of 50 per cent nitric acid. The die-casting alloy will turn black (the precipitate is apparently Zn_7Al_3) while plain zinc will remain clear. But, too often, the nonferrous control chemist is offered tests not sufficiently specific or too sensitive to yield the information he desires. A spot test for silicon may be excellent but its weakness in yielding the same response when phosphorus is present prevents the chemist from relying upon it because most of the red metals he encounters have a trace of phosphorus in them.

A good spot test for lead or tin may not be used because it responds to very low concentrations of those elements normally present, say, in a commercial grade of copper. Thus, the chemist, trying to discover whether the sample is copper or

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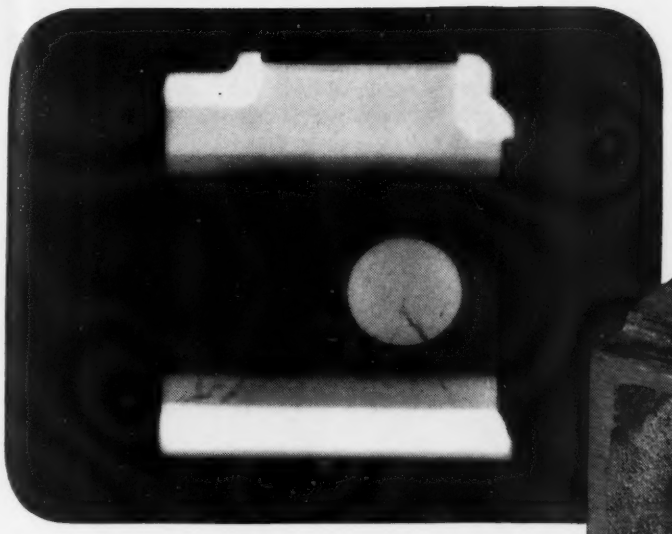
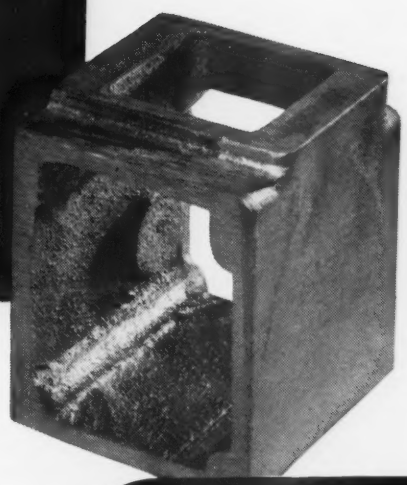
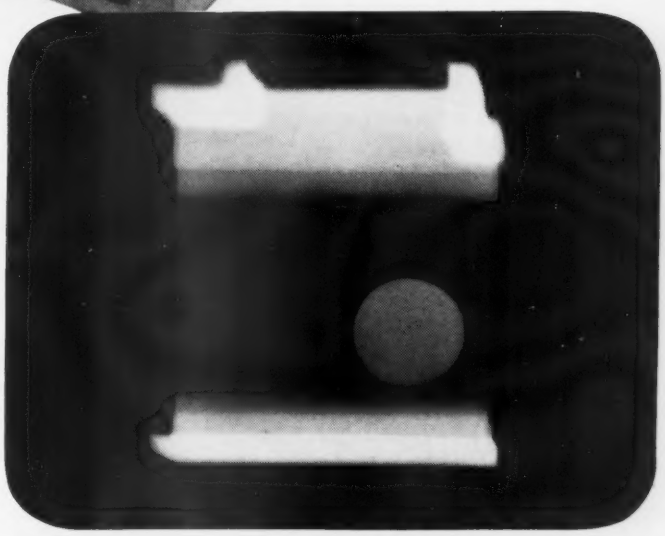


Radiograph shows recurring irregularities due to shrinkage.



RADIOGRAPHY

puts the finger on a profit thief



A change in gating produced sound castings.

Shrink was a problem in casting this instrument housing of 355 aluminum. It looked like the yield would run low.

But radiographs of pilot runs put the finger on the cause—revealed a pattern of recurring irregularities. This suggested a change in gating which, when adopted, quickly corrected the difficulty.

Cases like this show why more and more foundries make radiography a routine practice. It proves their work sound—helps build a reputation for consistently good castings.

Wouldn't you like to know how Radiography can work for you? Get in touch with your x-ray dealer. Or, write us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...
another important function of photography

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(*Concluded from page 202*)

bronze, can deduce little from the test. Or the spot test may call for the removal of almost all other elements before testing for the presence of a specific element and so defeat our aim of rapidity. Other tests have only a theoretical interest because the reagents are hard to secure, are very expensive or can be kept from decomposing or changing only with difficulty. Nevertheless, the inherent attractiveness of spot testing from the standpoint of time saved ensures a receptive, if cautious, attitude.

It would seem that greater use of complexation to tie up interfering elements, rather than the use of filtration, would be desirable, as would more use of inorganic compounds and adjustment of the concentrations of the reagents used so as to indicate not only the presence of the element but its presence in a certain range of concentration.

Sometimes a spot test may be used where the test in question is ordinarily done with the entire solution. To check for bismuth in a white metal sample 15.0 ml of concentrated sulphuric acid are used to dissolve the sample and the solution is taken to strong fumes of white sulphur trioxide. The solution is cooled to room temperature, diluted with 200 ml of distilled water, capped and mixed. One ml of the solution is transferred to a white spot plate and one drop of a 10 per cent solution of sodium sulphite added. Then, when one drop of a quinaldine-iodide solution (150 ml quinaldine, 50 ml concentrated sulphuric acid and 75 grams of potassium iodide per liter of solution) a brilliant precipitate of orange-red color will come down if bismuth is present.

Suggests Time Savers—A small saving of time per determination will often amount, cumulatively, to a respectable number of man-hours. When a given weight of reagent is to be added each time the reagent may be briquetted in the required weights or a cup made so as to hold the required weight when it is filled. Ammonium persulphate, for example, is added during the test for manganese to the extent of 2-3 grams. Thousands of weighings have been saved by the simple use of a cup. Composite reagents also save time. In the same test 15 ml of 0.33 per cent silver nitrate solution are added to the sample dissolved with nitric acid. The same result is effected by adding the required amount of silver nitrate to 50 per cent nitric acid and having only one reagent to handle.

Several other time savers may be mentioned here. During the determination of tin and antimony in white metals the sample is fumed with concentrated sulphuric acid and the solution allowed to come to room temperature before distilled water is added. The cooling period may be lessened by using air blowers against the flask. A further cooling period later to 59° F, after the antimony titration and reduction of the stannic ion, may be hastened by the addition of small pieces of dry ice to the solution. The reduction of the stannic ion requires less time than generally is recommended. A minute per 1 per cent tin is always sufficient.

Time may be saved by arranging a table of multiples of a given factor; for lead dioxide, for instance, or for various volumetric factors. For the same reason factor weights, whenever possible, should be used in preference to whole number weights.

When all the platinum crucibles are in use ordinary glazed porcelain crucibles may be used in silicon determinations. The average error due to using the latter crucible is 0.2 mg.

The use of a power-driven saw to obtain samples saves hand labor and is more rapid.

When lead is to be removed in a white metal alloy so that one may determine the zinc present, it is quicker to remove the lead electrolytically as the dioxide or as the metal than to precipitate the lead as the sulphate because in the latter method at least one hour is required for quantitative precipitation.

References

1. Goldberg, C., *Chemist Analyst*, Vol. 42 p. 35, 1953.
2. Dobbins, T. and Goldberg, C., *Chemist Analyst*, Vol. 40, p. 36, 1951.
3. Kinnunen, J. and Merikanto, B., *Chemist Analyst*, Vol. 41, p. 4-5, 1952.
4. Luke, C. L. and Campbell, M. E., *Analytical Chemistry*, Vol. 24, p. 1056, 1952.

Welding Film Available

Eutectic Welding Alloys Corp., has produced and is making available for distribution free of charge to all technical societies, schools, colleges, plants, and others, a 19-minute color, sound movie titled "New Welding Procedures."

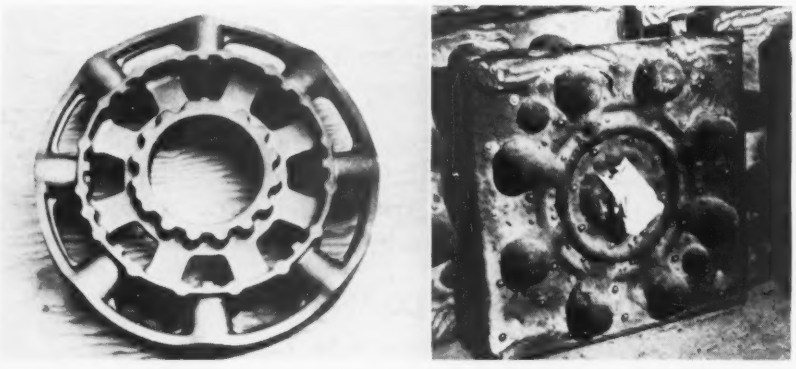
Strictly a technical motion picture, the film explains step-by-step techniques in the use of welding rod and electrodes. A four-page booklet describing the film is available from Eutectic Welding Alloys Corp., 40-40 172 St., Flushing 58, N. Y.

Howard Foundry Expands on West Coast

Howard Foundry Co., Chicago, is opening a new precision investment casting division in Los Angeles. Close-tolerance, complex ferrous castings requiring minimum machining are to be produced. When additional building expansion is completed early in April, the new division will be staffed by personnel from the company's new Milwaukee plant which is now in full production.

West coast precision facilities will adjoin the electric alloy steel sand casting division, until now the only Howard plant sand casting stainless steel.

During March Howard also started casting beryllium copper in its aluminum and bronze division to supply this alloy in the Chicago area. The company recently completed two semi-mechanized production line systems for dry sand molds, one in its aluminum division and another in its magnesium plant, both in Chicago.



SHELL MOLDING DOES IT: According to Cooper Alloy Foundry Co., Hillside, N. J., stainless steel jet engine support rings like the one shown at left could not be cast to required tolerances except by the shell molding process. Before casting, the mold halves are bolted together, as at right. Finished casting weighs 37 lb. Cooper uses phenolic resins made by Bakelite Co. Division, Union Carbide & Carbon Corp.

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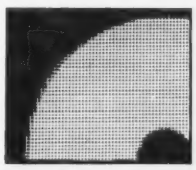
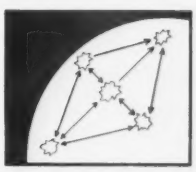


Reinforced with tough glass fiber for rugged STRENGTH and LONG LIFE.



New "BZ" Bond holds abrasive particles exactly right for OPTIMUM CUTTING POWER.

New Spiral Grooved sides give COOLER, CLEANER CUTTING on the 14" to 20" dia. sizes.

Micro photo shows "air-cooling" groove design that adds NON-BURNING feature.

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Available in Aluminum Oxide abrasive (for cutting metals), and Silicon Carbide abrasive (for cutting non-metallic materials). Call in your BAY STATE REPRESENTATIVE for details, or write for size and specification data.

Development of the new "BZ" bond was aimed at improving safety, cutting rate, and wheel life for all cut-off work on steel bars, pipe, angle iron and other structural shapes, as well as ferrous and non-ferrous castings.

Actual tests show fast, clean cuts on these materials, plus performance records of 10 to 20% better life... and up to 20% faster cutting rate than the best competition.

BAY STATE says to its sales force and to you, "We believe this 'BZ' SAF-T-CUT wheel to be the best reinforced resinoid cut-off wheel on the market today, from every point of view". Ask for a demonstration.

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Foundry Developments

By EDWIN BREMER

Metallurgical Editor

INVESTIGATION has indicated that in numerous cases where certain difficulties were encountered with molding sand conditions, adjustment of the pH value to around 8.0 aided considerably in overcoming the troubles. In the various references encountered, mention is made that the pH value is determined electrometrically with a pH meter, but it occurs to us that a more widespread interest would be forthcoming if some simple means of determining pH was developed. We understand that pH of drilling muds used in oil-well drilling is determined in the field by one method using gelation papers coated with indicators covering a pH range from 6.0 to 13 by 0.1 pH increments. Since molding sands are not "messy" like drilling muds, it appears that it would not be difficult to adapt the use of such papers to foundry use.

* * *

LIBRARY of Congress, Photoduplication Section, Washington 25, has available report PB 109239 entitled "Advanced Casting Techniques and Processes," which describes a process of casting high-temperature alloys into ceramic molds. Procedure was developed at Alloy Engineering & Casting Co., Champaign, Ill., for the Department of the Navy. Report comprises 147 pages and price in microfilm is $5.75; in photostat $18.75.

* * *

INVESTIGATION on "Structure of Graphite Spherulites" by M. N. Parthasarathi and B. R. Nijhawan, National Metallurgical Laboratory, Jamshedpur, India, and published in the Dec. 31, 1953 issue of *Foundry Trade Journal* resulted in the following conclusions: The "radial structure" is confined to sections passing through the spherulite center or its vicinity. The "structureless pattern" is observed in sections taken away from the center. The "white spot" is not located at the center of the spherulite. It cannot be attributed to the presence of a foreign nucleating agent. The white central spot is observed in sections taken away from the center and is generally associated with the "structureless" pattern. The area of the central white spot is not directly proportional to the cross-sectional area of the spherulite.

* * *

COMPANION reports on investment casting of SAE 1040 steel now available from the Office of Technical Services, Washington 25 are "Investment Casting of SAE 1040 Steel" and "Heat Treatment of Investment Cast SAE 1040 Steel." First deals with the practical manufacturing method of making investment castings in commercial carbon steels, and the second with method of restoration of carbon to the decarburized surfaces of the investment-cast steel. Investment casting method is designated Report PB 111199, and the heat treatment as Report PB 111198. Each is priced at 50 cents.

* * *

FAST, accurate nondestructive instrument for sorting mixed metal parts with varying alloy content has been developed by General Motors Research Laboratories. Known as the "Thermoelectric Metal Comparator," the device shown in the accompanying illustration is portable, easy to operate, and usable for separation of parts which differ only in composition. The instrument also can detect chill in castings as well as measure thickness of paint films and electroplates.

The comparator uses the principle of the thermocouple, employing two probe tips of different metals, with the part being tested between them to complete the circuit. Temperatures of the two junctions are kept constant—one at 170° F and the other at room temperature—and the change in metallic composition of the part under test results in a small voltage change that is amplified and indicated on a sensitive quick-response meter. Several sets of probes are available in different alloys of steel and other metals, and the usual method of choosing a set is to try them and select that which gives the best separation readings. For a particularly difficult separation of mixed parts it is possible to make a special set of probes.

* * *

RECENT news release from Ford Motor Co. discussing use of radioactively "tagged" iron ore in the blast furnace to trace its flow and reduction to metallic iron suggests that a similar idea might be applied to cupola melting sometime in the future. It also might be mentioned that Japanese investigators have used radioactive sulphur to determine its diffusivity in slag and found that it varied from 0.9 x 10^{-6} cm^2/sec at 1445° C to 2.6 x 10^{-6} cm^2/sec at 1580° C as compared to sulphur's diffusivity in iron of 10^{-3} cm^2/sec. This means that, for good desulphurization, as large as possible interface between molten iron and slag is desirable.

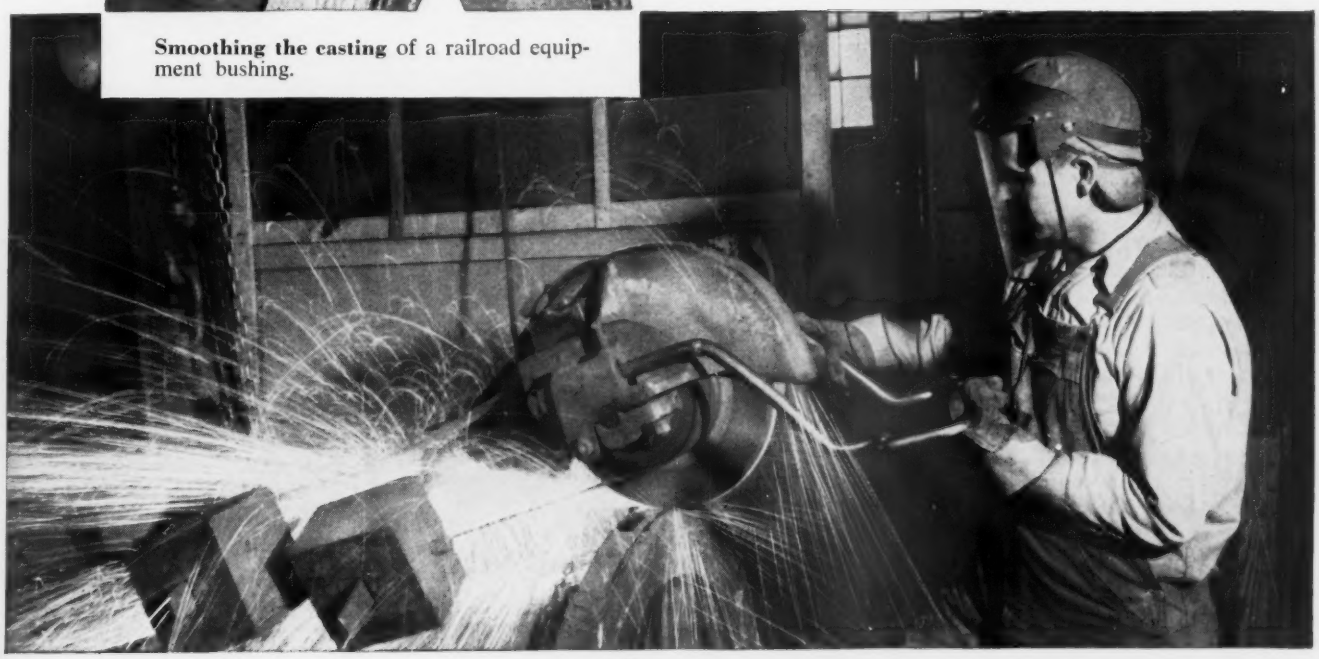
* * *

IN A discussion of the manufacture of pressure-cast aluminum matchplates, D. H. Potts in the Feb. 11 issue of *Foundry Trade Journal* indicated that with two skilled men, two process workers, and two girls working 44 hr per week, 22 to 24 plates were produced in that period. With such production the maker often could afford to cater for any orders involving 100 castings and upward.

Foundrymen tell why they pick "U. S." Grinding Wheels

Smoothing casting of an elbow with a resinoid U. S. Royalite Wheel.

Smoothing the casting of a railroad equipment bushing.



Grinding a casting of Pearlitic Malleable iron.

Consider, for example, a foundry in Georgia, casting steel pipe fittings, removing gates and flash, grinding openings and bolt holes. The management standardized on resinoid U. S. Royalite® Wheels exclusively because they had proved to be the most efficient and economical.

Then there were the makers of Meehanite castings. They found that United States Rubber Company's wheels could not only grind Meehanite but steel and alloy castings as well—enabling them to stock just *one kind of wheel*. So now it's "U. S." for Meehanite.

Another foundry settled on "U. S." Wheels to grind gates from castings of Pearlitic Malleable Iron. Why? Because the wheels stayed cool under the high-pressure, high-speed grinding – and showed excellent economy.

There are countless other success stories about "U. S." Wheels. Whatever the application, whatever the resinoid or rubber wheel required, "U. S." will provide you with precisely the *right* one for the job.

Keep in mind that the "U. S." sales engineer is a specialist in abrasives. Consult him on any of your high-speed grinding wheel problems. It pays off. Get in touch with him through the address below.

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Activities of Foundry Groups

New England

A TALK on "Air Placement of Foundry Refractories" attracted a good attendance of members to the Feb. 10 meeting of the New England Foundrymen's Association. The meeting was held at the University Club, Boston. James R. Douglas, president, Blastcrete Service Co., Los Angeles, described the use of his organization's gun for blowing in cupola refractory linings.

Because of the conflict of the association's regular meeting night with the American Foundrymen's Society convention in May, the group will meet the third Wednesday in May.—*Alexander Beck, Whitman Foundry Inc.*

Texas

A MOST enjoyable and expertly prepared paper was presented to members of Texas Chapter of the AFS in Dallas, Tex. on Jan. 15 by Hiram Brown, chief metallurgist, Solar Aircraft Co., Des Moines, Iowa. His talk was entitled "Light Metal Foundry Practice," and he illustrated it with slides and a chalk talk.

Members of the chapter from the eastern section of the state met Jan. 22 at Longview, Tex. for a "Jack-Pot" meeting. W. M. Peterson, M. A. Bell Co., St. Loius, addressed the 57 members present on "Molding Sand Practice." He was followed by presentation of the Ford Motor Co. film showing the extent of automation in its new Cleveland plant. The meeting concluded with the color motion picture of the operation of the Tyco shell molder, a machine produced by Tyler Metal Products Co., St. Louis.

On Feb. 12 approximately 50 members of the chapter met at Beaumont, Tex., to hear J. Wesley Cable, consulting engineer for Girdler Co. Thermex Division, Louisville, Ky., give a paper entitled "Recent Advances in Dielectric Core Baking." Mr. Cable used a blackboard to illustrate and simplify the explanation of this new technique.—*William A. Bearden, M. A. Bell Co.*

Chicago

A DOUBLE-BARRELED technical program for the Mar. 1 regular meeting of the Chicago Chapter, AFS, leveled its sights on recent developments in molding processes. Specifically, the spotlight was directed on the D-process and pressure molding. That these subjects have wide appeal was evidenced by the attendance of over 300 members and guests, the top for this year.

Something special in the way of entertainment for the meeting was appearance of the Continental male chorus by courtesy of the Continental Foundry & Machine Co., East Chicago, Ind. The group of 20 singers under direction of Dean Croxton gave a generous number of selections. Accompanist was Elain Katzouras. Benny Meo, a member of the chorus, provided accordian music during the social period.

W. O. McFatridge, superintendent of the foundry research laboratory, Manufacturing Research Division, International Harvester Co., presided at the technical portion of the meeting. The D-process was described by Frank S. Brewster, vice president and general manager, Harry W. Dietert Co., Detroit, and pressure molding was discussed by T. E. Barlow, sales manager, Eastern Clay Products Department, International Minerals & Chemical Corp., Chicago.

Mr. Brewster explained that the new D-process, which consists of blowing a mixture of sand and oil between a pattern and contoured

(*Continued on page* 210)

TEXAS Chapter of the AFS met on Jan. 15 in Dallas, Tex., and on Feb. 12 at Beaumont, Tex. The East Texas Section of the chapter met Jan. 22 at Longview, Tex. In top left view, left to right, at the Dallas meeting, are R. H. Kale and J. F. Lacey, Texas Bronze Mfg. Co., Fort Worth, Tex.; Hiram Brown, Solar Aircraft Co., Des Moines, Iowa, speaker; and G. W. Hatcher, Texas Bronze Mfg. Co. Left to right, top right view, at the Longview meeting, are Bob Smith, Smith Steel Castings Co., Marshall, Tex., sectional chairman, and W. M. Peterson, M. A. Bell Co., St. Louis, speaker. Bottom left, left to right, at the Beaumont meeting, are J. Wesley Cable, Thermex Division, Girdler Corp., Louisville, Ky., speaker, and Mr. Craig, Richardson Brass Works, Hot Springs, Ark. Left to right, bottom right, at the Dallas meeting, are Ivan Greene, Eastern Clay Products Co., Fort Worth; Israel Smith, Western Foundry Co., Tyler, Tex., chapter chairman; and P. B. Croom, Houston Pattern Works, past chairman

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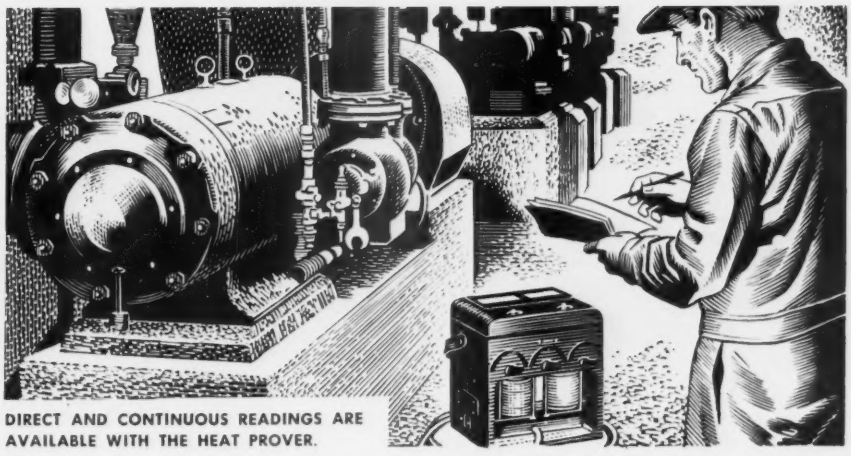


DIRECT AND CONTINUOUS READINGS ARE AVAILABLE WITH THE HEAT PROVER.

(*Continued from page* 208)

drier, will not revolutionize molding, but it is useful and will have a proper place. The pattern is used cold. Hope is for production of 250 shells an hour. Casting finish, he said, is determined by the sand used.

From 2 to 2.5 per cent oil binder is mixed with the sand. A little fly ash also seems desirable. The speaker voiced the expectation that the D-process will prove more economical than some other shell processes because materials cost less.

Mr. Barlow asserted that pressure molding is a green sand process which started about four years ago and which is now approaching commercial success. Rosin type resins are employed and pressures run around 600 to 700 pounds, although pressure varies for different applications. It is a matter of applying whatever pressures are necessary to get the desired sand density.

Continuing, the speaker dealt with the three main factors of the process. These are (1) equipment—patterns must be strong and flasks rigid; (2) molding equipment—use of a rubber diaphragm makes the whole mold a piston; and (3) Sand.

The chapter's Apr. 5 meeting at the Chicago Bar Association will feature four roundtables. Gray Iron division will consider "Making Good Castings Cheaper"; Malleable will look into "Improved Methods and Lower Cost"; Nonferrous, Steel and Pattern divisions will combine to discuss "Casting Design"; and the maintenance group will direct attention to "Foundry Lubrication."—*Erle F. Ross*

Pittsburgh

PATENT problems occupied members of the Pittsburgh Foundrymen's Association at the Feb. 15 meeting, held at Webster Hall Hotel. Eugene F. Buell, patent attorney with Blenko, Hoppes, Leonard & Buell, was the speaker.

Mr. Buell first explained why patents exist. Their purpose is to pass along new inventive ideas after a certain period of monopoly. The chance for a monopoly encourages new industrial developments.

Certain requirements must be met to secure a patent. The development must be new, a preliminary search conducted by the patent office determining this. Second, the subject matter must be useful. The invention must not have been in public use more than one year before application for a patent and news of the invention must not have been published more than one year before application.

Procedure to secure a patent includes deciding the true inventor and preparing specifications of the invention, claims for it and preparing drawings. A division of the patent office then examines the application which will be either allowed or rejected. "Advances promoted by our patent system make us a leading industrial nation by providing incentive for making new development," Mr. Buell concluded.—*Robert M. Love*

Central Michigan

ATTENTION of members of Central Michigan Chapter of the AFS was directed to foundry education in the district's schools at the Jan. 20 meeting held at Hart Hotel, Battle Creek, Mich. Preceding the meeting, the board of directors of the chapter visited the Battle Creek Vocational School to observe foundry practice there.

During the meeting, Avery Allen, instructor at the school, presented to the entire membership a description of the activities of the school. Ashley Sinnett of the Mechanical Engineering Department, Michigan State University, then described foundry activities at Charlotte High School.

Lewis C. Heisler, Gale Mfg. Co., was technical chairman for the meeting and introduced the speaker, Howard Wilder, manager of the Iron Foundry Division of Vanadium Corp. of America. Mr. Wilder discussed cupola operations and pointed to the many advantages of a front slagging cupola. Following his talk, the film on shell molding produced by Central Foundry Division of General Motors Corp. was presented to the audience.

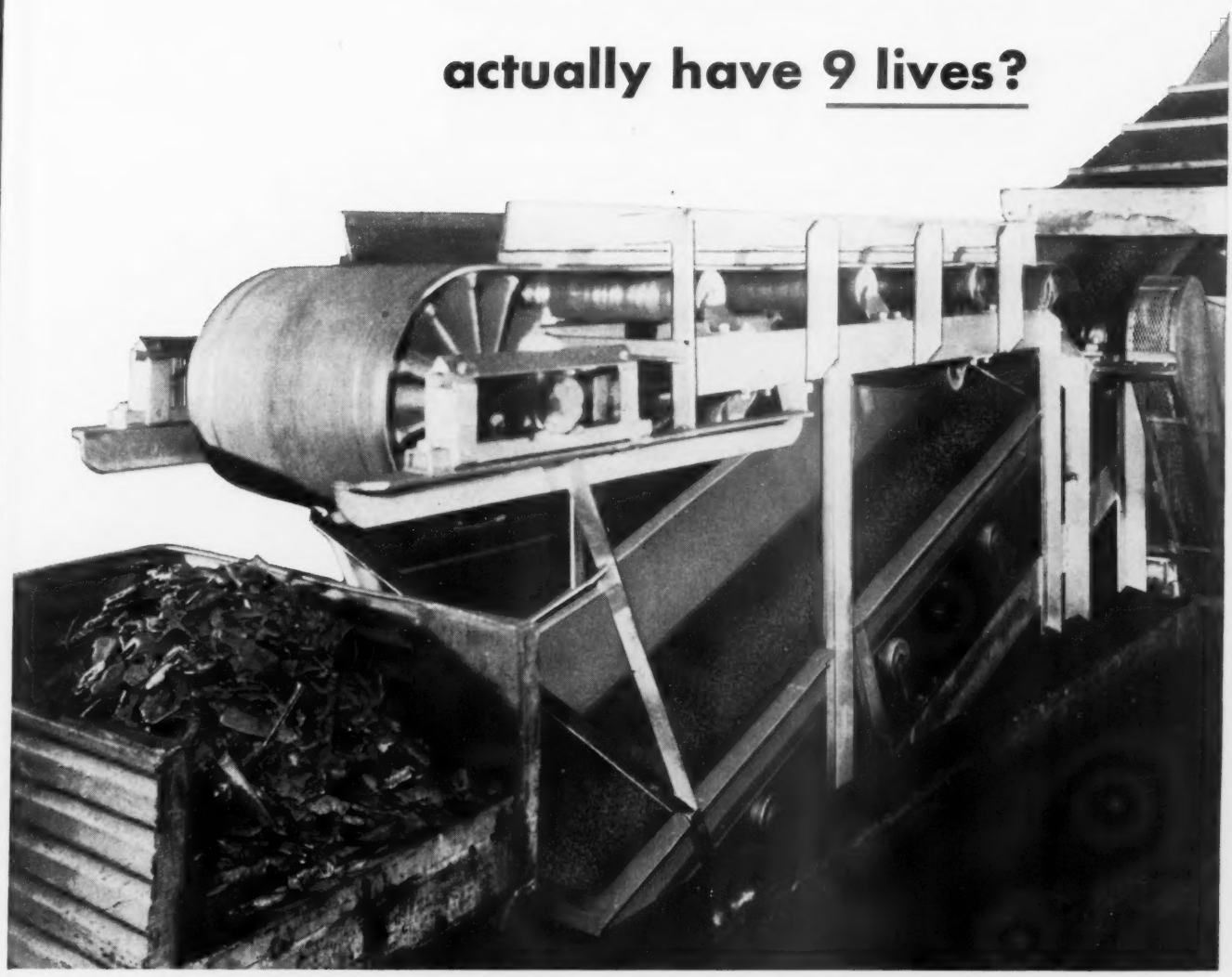
A film titled "Mechanization in Coremaking" was presented at the Feb. 17 meeting of Central Michigan Chapter of the AFS, held at the Hart Hotel, Battle Creek, Mich. Irving Dennen, public relations manager, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, presented the motion pictures, which had been produced by that company. Technical chairman for the meeting was Albert Doerr, chief engineer of Midwest Foundry Co., Coldwater, Mich.

As a coffee talk feature, a movie taken during the recent Tournament

(*Continued on page* 212)

CHICAGO Chapter of the AFS met on Feb. 2 to hear William S. Pellini, superintendent of the metallurgical division, Naval Research Laboratory, at Washington, and also to announce the establishment of the Robert E. Kennedy Scholarship Fund at the University of Illinois. Left to right top are Timothy Balaban, Navy Pier Branch, University of Illinois, who made the molds from which the plaque was cast; Roy W. Schroeder, associate professor, foundry and pattern laboratory, University of Illinois; and Prof. Kennedy. Below, left to right, are Mr. Kennedy; R. E. Doelman, Miller & Co.; Mr. Pellini; and John A. Rassenfoss, American Steel Foundries, chapter chairman

Does this Resistorip shake-out belt actually have 9 lives?



Already this 30″ wide, 220 ft. long *Resistorip* belt has lasted *7 times* as long as the best previous belt of conventional construction on this shake-out conveyor. And it's still going strong in one of the country's largest grey iron foundries.

The secret of this belt's money-saving resistance to ripping and slitting is its unique patented construction. At close intervals throughout its length, groups of high-tensile steel wires are built into the carcass at right angles to its direction of travel. When a sharp, jagged metal flashing starts to rip the belt, it quickly encounters one of these transverse wire groups. Immediately it is kicked out . . . and damage to the belt is restricted to a small section, only inches in length!

If you are now replacing shake-out belts every 4 or 5 months, or less, think what you'd save with a belt that lasts for *years!* Call your NYB&P Distributor today. He can provide you Resistorip belting with any required thickness of heat-resisting rubber cover. For his name and address phone PRescott 7-6940, Passaic, N. J., or write to address below.

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CHESAPEAKE Chapter of AFS held its annual oyster roast on Jan. 9 in Baltimore. Over 380 foundrymen from Maryland, Pennsylvania and Virginia were present at the affair, at the Alcazar

(*Continued from page* 210)
of Roses on New Year's Day in Pasadena, Calif., was shown.—*Bob Dodge, Archer-Daniels-Midland Co.*

Connecticut Non-Ferrous

MEMBERS of the Connecticut Non-Ferrous Foundrymen's Association met Feb. 17 at the Garde Hotel, New Haven, Conn., to hear Ray Olson, Shell Process Inc., Chicopee, Mass., speak on "Shell Molding Equipment."

Mr. Olson illustrated his talk with slides and covered the many phases of the shell process in considerable detail. He stressed that shell molding must be considered still in its infancy even though great strides have been made in the few short years since its introduction. He pointed out the trend to horizontal pouring and how this feature does away with the bothersome backing up of vertically cast molds.

Mentioned also was the increasing use of combination cope and drag patterns from which both halves of the mold are made at the same time. Shells from such a pattern are snapped in two as soon as made and the two halves immediately glued together. Shell molds made in this way are poured while still warm and can readily be geared to a fast production setup.—*John V. McCarthy, North American Smelting Co.*

Canton

REGULAR meeting of Canton District Chapter of the AFS was held Feb. 4 at the Barberton Elks Club, Barberton, Ohio. There were 95 members and guests present to hear Thomas W. Seaton, sales engineer, American Silica Sand Co., Ottawa, Ill., whose talk was entitled, "Traveling with a Grain of Sand." He showed color films illustrating the mining and processing of foundry sands. In addition, Mr. Seaton discussed the importance of using proper specifications in buying foundry sand.

Robert A. Epps, Stoller Chemical Co., chapter chairman, presided. Alfred S. Morgan, Babcock & Wilcox Co., introduced the speaker.—*R. R. Kozinski, Canton Malleable Iron Co.*

CANTON Chapter of the AFS met Dec. 3 at the Barberton Elks Club to hear L. D. Richardson, divisional manager and welding consultant, Steel Sales Division, Eutectic Welding Alloy Corp., speak on "New Advances in Foundry Welding." Left to right are Robert A. Epps, Stoller Chemical Co., chapter chairman; Alfred S. Morgan, Babcock & Wilcox Co., vice chairman; Mr. Richardson; and Anton Dorfmueller Jr., Thiem Products Co., membership chairman

Detroit

THE regular meeting of Detroit Chapter of the AFS held on Jan. 21 was titled "Foundry Equipment and National Officers' Night." It was held at the Detroit-Leland Hotel. Harry McMurray, Ford Motor Co., acted as moderator and introduced the 11 speakers, each of whom was limited to five minutes to describe and explain new equipment which their companies are manufacturing for the foundry industry. This type meeting has proved to be of great interest to the membership.

Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., and president of AFS, spoke briefly on activities of the society; William W. Maloney, national secretary-treasurer, also addressed the group. Other special guests who have served the society as directors and who were present at the meeting included Frank C. Riecks, Ford Motor Co.; Vaughn C. Reid, City Pattern Foundry & Machine Co.; Harry W. Dietert, Harry W. Dietert Co.; Edward C. Hoenicke, Eaton Mfg. Co.; and Fred J. Walls, International Nickel Co.

The annual Castings Defects Clinic was arranged by Detroit Chapter of the AFS on Feb. 18. Guests at the meeting included three professors and eight members of the Michigan State AFS student chapter and a professor with six members of the Michigan student chapter.

Chapter Chairman Harry Gravlin, who now is associated with the Lincoln Mercury Division of Ford Motor Co., did an excellent piece of work in getting audience participation in the open forum discussion on defects of the castings which were presented.

New chapter members were introduced, and the meeting was closed by the vice chairman, Claude B. Schneible, Claude B. Schneible Co.—*R. Grant Whitehead, Claude B. Schneible Co.*

Southern California

A DISCUSSION of coreroom mechanization was featured at the Feb. 12 meeting of Southern California Chapter of the AFS. Approximately 140 members were present at Rodger Young Auditorium, Los Angeles, to meet Chester V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, the speaker.

Mr. Nass' talk was supplemented by an interesting movie which showed various degrees of coreroom mechanization. He pointed out that even smaller foundries can afford to mech-

(*Continued on page* 215)

telling the story of 'dag' dispersions

Why You Should Use 'dag' Dry-Film Mold Wash

Above all, you want a mold wash to prevent sticking. A 'dag' dispersion of colloidal graphite does it best because it is a unique, friction-fighting material that forms a microscopically thin *dry lubricating film.* This film is more slippery than almost anything you can name.

'dag' dispersions can be applied by spraying, painting or dipping. Try them as parting compounds in sand, permanent-mold, and die casting . . . on molds, patterns, chills, cores, push pins, shoulder screws, flask pins, and ladle interiors. Parting will be quicker, castings smoother. Binding and stripping will be eliminated. Chills will tap off easily.

As an added benefit, water dispersions of 'dag' Colloidal Graphite get rid of the irritating smoke caused by most parting compounds.

More information available free in our Bulletin No. 425-D3.

Dispersions of molybdenum disulfide are available in various carriers.

We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

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. . . also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

try 'dag' resin-bonded dry films for permanent lubrication

A GOOD process made still BETTER

a BETTER Cupola Gun and a BETTER Cupoline

Do you want faster, more lasting and therefore cheaper cupola patching? You can get it in the Bondact process. The Bondact process equals the Cupoline refractory plus the Bondact gun. Both parts have been improved—the entire "package".

Thanks to our advancing methods, a new *Cupoline* now brings you a still more effective composition and greater uniformity. Results: increased flowability, minimum rebound and negligible burn-out.

Bondactor as redesigned has: (1) a new, exclusive air recovery system to reduce air consumption per pound of refractory, (2) a larger, more powerful air motor, (3) an improved rate of flow control, (4) a heavier, more positive material valve assembly, and (5) minimum maintenance.

ONLY ECP CAN PROVIDE THE COMPLETE PACKAGE
the equipment AND *the refractory*
BONDACTOR CUPOLINE

Write for OUR ATTRACTIVE PRICES ON REBUILDING YOUR PRESENT BONDACTOR TO MODEL 1250 EFFICIENCY

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(*Continued from page* 212)

anize coreroom operations, but cautioned that particular requirements and phases of operation must be considered when mechanization is planned. There is no rule of thumb which can be applied for every coreroom operation.

Charles Gregg, Gregg Iron Foundry, chapter program chairman, invited everyone to attend the sand school the chapter is sponsoring on May 19-21. The course will be conducted by F. S. Brewster, vice president, Harry W. Dietert Co., Detroit.

At the chapter's January meeting, Walter R. Jaeschke, Whiting Corp., Harvey, Ill., presented a talk entitled, "Cupola Operation and Mechanization." He showed slides and also a movie which illustrated practical ways of mechanizing the charging of cupolas. In the discussion period which followed, Mr. Jaeschke answered many questions regarding cupola operation.

James Oliva announced that the annual Ladies Night dinner and dance is to be held Saturday, May 1, at the Pacific Coast Club, Long Beach.—*Otto H. Rosentreter, Foundry Equipment Co.*

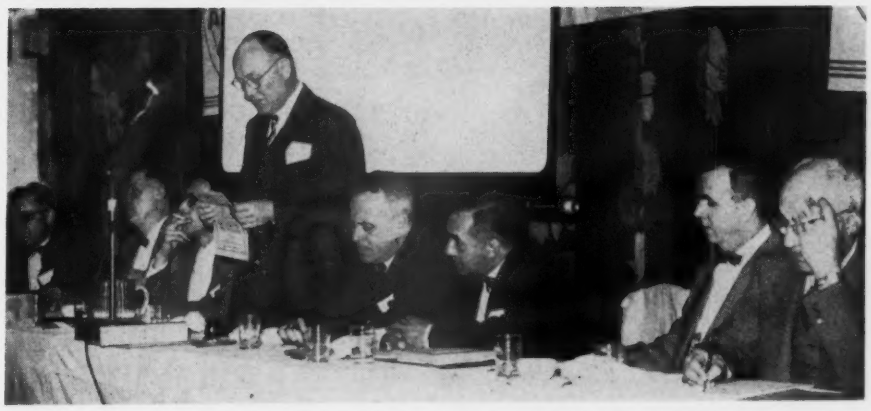
St. Louis

A CAPACITY crowd was present at the Feb. 11 meeting of St. Louis District Chapter of the AFS to hear a discussion of "Spectroscopy in Modern Foundry Control." This new method of chemical determination was described by two well qualified speakers, Prof. Adolph Legsdin, Missouri School of Mines and Metallurgy, Rolla, Mo., and D. R. Moore, National Spectrographic Sales Corp., Cleveland.

Professor Lagsdin outlined the basic apparatus and the principles of operation, and Mr. Moore described equipment available and the techniques to be followed for efficient operation. Both speakers used slides to illustrate their talks. John H. Culling, who is engaged in spectrographic analysis at Carondelet Foundry Co., was technical chairman.

A special guest at the meeting was A. L. Hunt, National Bearing Division, American Brake Shoe Co., a national director of AFS, who reported on the activities of the national organization.

Information on the first spring dinner dance was announced. It is to be held May 1 at the Norwood Hills Country Club, and all members and friends were urged to attend and assure the success of this social activity.—*Jack Bodine, Bodine Pattern & Foundry Co.*



ST. LOUIS Chapter of the AFS met Feb. 11 to hear Prof. Adolph Legsdin, Missouri School of Mines and Metallurgy, Rolla, Mo., and D. R. Moore, National Spectrographic Sales Corp., Cleveland, discuss spectroscopy in the foundry. From left to right are Mr. Moore; Prof. Legsdin; J. H. Culling, Carondelet Foundry Co.; Webb L. Kammerer, Midvale Mining & Mfg. Co., chairman of the chapter; A. L. Hunt, National Bearing Division, American Brake Shoe Co., who is a national director of the AFS; Fred J. Boeneker, Bronze Alloy Co.; John O'Meara, Banner Iron Works; and Paul E. Retzlaff, Nordberg Mfg. Co.

Northeastern Ohio

ATTRACTED by a dual technical program, over 250 members and guests turned out for the Feb. 11 meeting of Northeastern Ohio Chapter of the AFS, at the Tudor Arms Hotel, Cleveland. In the absence of Chapter Chairman S. E. Kelly, Eberhard Mfg. Co., the presiding officer was David Clark Jr., Forest City Foundries Co., chapter vice chairman.

The general technical session featured showing of the AFS film, "Effect of Gating Design on Casting Quality," the third in a series; it deals with the sprue base problem. Jack Kroecker, Mohawk Foundries Inc., served as chairman of the session. Introductory remarks were made by Walter E. Sicha, Aluminum Co. of America, who also led the ensuing discussion.

This film was produced by Battelle Memorial Institute under guidance of the AFS Light Metals Research Committee. The tests are conducted with water poured into transparent lucite

(*Continued on page* 218)

SOUTHERN CALIFORNIA Chapter of the AFS met Jan. 15 and Feb. 12 at Rodger Young Auditorium, Los Angeles. Left to right are Harold G. Pagenkopp, Angelus Pattern Works; Dominic Meaglia, American Foundry; Walter R. Jaeschke, Whiting Corp., Harvey, Ill., Jan. 15 speaker; Richard Meaglia, American Foundry; J. Donald Locke, Long Beach Iron Works; Robert Gregg, Reliance Regulator Corp.; Charles R. Gregg, Gregg Iron Foundry, program chairman; Chester V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, Feb. 12 speaker; and Hubert Chappie, National Supply Co. Photographs are by courtesy of K. F. Sheckler, Calmo Engineering Co.

The transfer of hot metal from one of the six 1000-pound Whiting Transfer Ladles to a 165-pound pouring ladle at Allis-Chalmers Foundry in La Crosse, Wisconsin. All twenty-seven of the foundry's pouring floors are equipped with Whiting Trambeam Cranes and Whiting Ladles . . . making many jobs fast as well as more pleasant.

IN LA CROSSE, WISCONSIN . . .

They like to work in the Allis-Chalmers Foundry

Whiting Foundry Equipment reduces heavy work of charging, transferring and pouring . . . cuts costs and increases production!

Employee-morale makes a lot of difference in the efficiency and productivity of a foundry! Whiting Equipment helps to make the Allis-Chalmers Foundry in La Crosse, Wisconsin a better, more pleasant place to work. It is an excellent example of efficient, economical foundry operation!

Learn about the *complete* line of Whiting Foundry Equipment, and what it can mean to *your* foundry in terms of economy, increased capacity and improved employee relations.

Write today . . . for full information!

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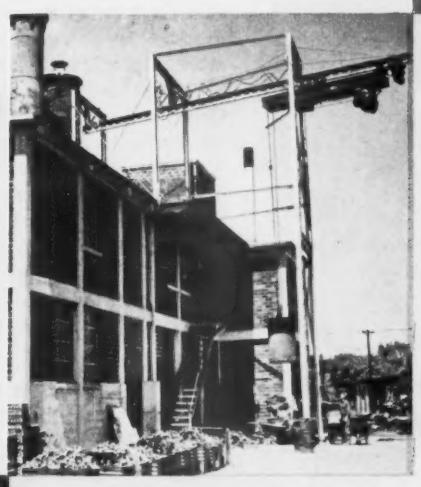
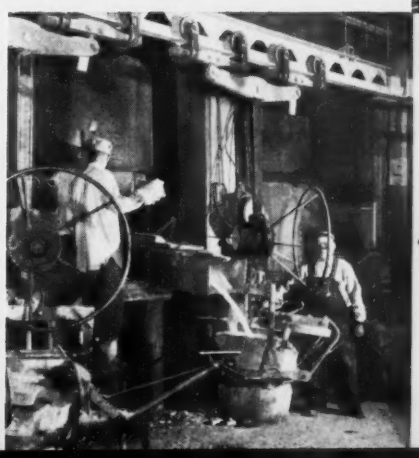
Whiting Foundry Products Include:

Cupolas • Cupola Spark Suppressors • Cupola Hot Blast Equipment • Cupola Blast Moisture Control Equipment • Cupola Charging Systems • Cradle Furnaces • Hot Metal Mixers • Duplex Melting Systems • Air Furnaces • Electric Melting Furnaces • Ladles • Ladle Handlers • Ladle Preheaters • Tumbling Mills • Annealing Ovens • Transfer Cars • Pulverizers • Pulverized Coal Firing Systems • Turntables • Electric Traveling Cranes • Trackmobile • Trambeam Overhead Handling Systems • Electric Chain Hoists

At Allis-Chalmers, pouring is a pleasant job—not a "back-breaker". Here, the weight of the pouring ladle is supported by the Whiting Trambeam Crane and it is possible to pour plow-share molds that are stacked four high.

Trambeam Charging System lifts the Whiting Cone-Bottom Bucket up to the level of the charging door, then runs the bucket into the wishbone support in the cupola. The drudgery—as well as the inaccuracy—of hand-charging is a thing of the past, and the charging cycle is now only 4½ minutes. *This method of charging has virtually eliminated cold spots in the cupola; cut the amount of coke used by 30 pounds per thousand-pound charge, and increased the carbon pick-up!*





The Whiting No. 6 Cupola is tapped directly into a transfer ladle which travels on a Trambeam Monorail. This cupola melts 8½ tons per hour.

METROPOLITAN Chapter of the AFS met Feb. 1 to hear a discussion of shell molding by Ernest H. Rubowitz, Newark Pattern Works, and Walter Sokolosky, Monsanto Chemical Co., Springfield, Mass. From left to right are Mr. Rubowitz, Mr. Sokolosky and Technical Chairman A. C. Blanche, Worthington Corp. Photograph by courtesy of John Bing, Metropolitan Refractories Corp.

(*Continued from page* 215)

molds. The molds utilize a gating ratio (area of sprue to runner and gate) of 1-4-4, rounded runner and gate corner, round or rectangular tapered sprue with top area three times that of bottom area, rounded corner at junction of sprue and pouring basin, and pouring practice which avoided pouring directly down the sprue and kept ladle close to pouring basin. The use of a vertical cylindrical well plus runner enlargement in the drag just under the sprue proved the best design in eliminating turbulence and entrapment of air into the mold.

The patternmaking division of the chapter conducted a separate technical session. Chairman was John F. Roth, Cleveland Standard Pattern Works; the speaker was John M. Thompson, sales engineer, Sherwin-Williams Co., whose topic was "What Research Offers in a Pattern Coating."

Mr. Thompson enumerated the characteristics a pattern coating ideally should possess and then, on the basis of a 5000-hr research project conducted by his company, showed how a number of common types of coatings had measured up to them. These include such qualities as hardness; resistance to abrasion, core binders, water, gasoline and other substances; gloss; proper drying; high solids content; brushability; and inoffensive odor.—*Robert H. Herrmann and Jack C. Miske*

Metropolitan

THE Feb. 1 meeting of Metropolitan Chapter of the AFS was designated National Officers Night, and special guests at the meeting were Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., president of AFS; William W. Maloney, secretary-treasurer of the society; and H. L. Ullrich, Sacks-Barlow Foundries Inc., Newark, N. J., a national director-elect.

Technical program of the meeting dealt with shell molding and featured three speakers. Walter A. Sokolosky, technical service engineer, Monsanto Chemical Co., spoke on "Resins and Methods of Coating Sands." Ernest H. Rubowitz, Newark Pattern Works, discussed, "Pattern Equipment," which also included information on materials and gating. Ray Olson, Production Pattern & Foundry Co., presented information on "Production Equipment" and showed slides illustrating various production methods.

Concluding the presentation was a talk by Warner B. Bishop, manager of the Foundry Products Division, Archer-Daniels-Midland Co., Cleveland, who described the D process of shell molding. A. C. Blanche, assistant iron foundry superintendent, Worthington Corp., served as technical chairman.—*W. T. Bourke, Brake Shoe & Castings, American Brake Shoe Co.*

NORTHWESTERN PENNSYLVANIA Chapter of the AFS was addressed by Lawrence D. Pridmore, president, International Molding Machine Co., La Grange Park, Ill., at its meeting on Jan. 25 and William Ball, R. Lavin & Sons Inc., Cincinnati, at Feb. 22 meeting. Mr. Ball is shown in the top view and Mr. Pridmore at the left below. At the right is Bailey Herrington, Hickman, Williams & Co., chapter vice chairman

Northwestern Pennsylvania

A DISCUSSION of "Human Engineering" attracted 100 members and guests to the Feb. 22 meeting of the Northwestern Pennsylvania Chapter of the AFS. The speaker was William Ball Jr., R. Lavin & Sons, Cincinnati.

The name of the subject seemed remote from foundry practice, but the group discovered that human engineering is one of the greatest contributors to making good castings. Mr. Ball pointed out that the responsibility for making good castings rests on the foundry foreman's shoulders and that regardless of how many dollars may be spent on new materials, a real job must be performed on the human aspect to make it useful.

In reporting on the chapter's promotion, "A Career in Metal," it was learned the film is being shown in 25 chapter territories and is being well received.

The cupola practice class had a very interesting visit on Feb. 13 to the Pickands-Mather Erie plant, where the students were able to see the making of pig iron and coke. It is planned that the chapter's educational committee will follow the cupola practice course next year with an advanced course on gray iron metallurgy.

A review of the development of

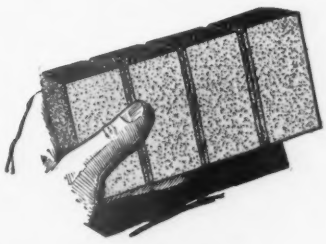
(*Continued on page* 220)

It pays TO PRACTICE CLEANLINESS IN IRON, TOO.

Famous CORNELL CUPOLA FLUX

PURGES MOLTEN IRON OF IMPURITIES
INCREASES FLUIDITY . . GREATLY REDUCES SULPHUR AND CASTING REJECTS.

Pre-Measured



Scored Brick Form

Famous Cornell Cupola Flux —a low cost guarantee of BETTER IRON whether you operate a gray iron foundry or a malleable foundry with cupolas.

WHEN you see foundries with an amazingly small scrap pile, it's practically a sure bet that Famous Cornell Cupola Flux is used to cleanse and condition molten iron.

Famous Cornell Cupola Flux has built a reputation through more than thirty six years' success in casting improvement. Why not use it in your foundry and profit by our outstanding achievement?

Famous Cornell Cupola Flux keeps cupolas cleaner, too, reduces maintenance. And the life of lining is prolonged, due to a glazed or vitrified protective surface which is formed on brick or stone.

Famous Cornell Cupola Flux costs but little to buy and its Scored Brick Form makes the labor in using practically nil. Simply lift it out of container and toss it into cupola with each ton charge of iron.

WRITE FOR BULLETIN NO. 46-B

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass ev when the dirtiest brass turnings or sweepings are used. Y pour clean, strong castings which withstand high pressu tests and take a beautiful finish. The use of this flux sav considerable tin and other metals, and keeps crucible and fu nace linings cleaner, adds to lining life and reduces maintenanc

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminu so that you pour clean, tough castings. No spongy or poro spots even when more scrap is used. Thinner yet stronger se tions can be poured. Castings take a higher polish. Exclusi formula reduces obnoxious gases, improves working condition Dross contains no metal after this flux is used.

TWIN CITY Chapter of the AFS listened to a talk on "Pattern Trends" at its meeting on Feb. 9. From left to right are J. W. Costello, American Hoist & Derrick Co.; Otto Harer, Scientific Products Co., Chicago, speaker; and O. Jay Myers, Foundry Products Division, Archer-Daniels-Midland Co., chapter chairman. Photograph by courtesy of R. J. Mulligan, Archer-Daniels-Midland

(*Continued from page* 218)

core and mold blowing was presented to members of the chapter at its regular meeting on Jan. 25. Bailey Herrington, Hickman, Williams & Co., Erie, vice chairman of the chapter, presided.

Although the weather was disagreeable, more than 100 members and guests were present, many having come from outlying communities, to hear Lawrence D. Pridmore, president of International Molding Machine Co. Mr. Pridmore in his talk offered many suggestions about the addition of some simple gadget which would decrease costs and increase output. He stressed the importance of location and proper size of core vents. In addition he pointed out that in some cases, with a slight extra core cost, scrap and the ultimate cost of castings could be reduced. He admitted that no company can afford to purchase the ideal equipment for every job and that care, therefore, must be exercised to obtain the most versatile equipment possible.

Earl M. Strick, Erie Malleable Iron Co., reported that five of the chapter's film strips entitled "A Career in Metals" now are being used in the public and parochial schools of Erie. —*Roy A. Loder, Erie Malleable Iron Co.*

Twin City

A DISCUSSION of "Pattern Trends" was presented by Otto Harer, Scientific Products Co., Chicago, at the February meeting of Twin City Chapter of the AFS.

Mr. Harer pointed out advances in patternmaking techniques designed for high production shops. Some concern the relatively new molding processes, the D process for shell molding, dielectric baking and expanding plastics molds. With regard to shell molding, the speaker described incorporating grooves in the cope and matching beads on the drag for matching of shells. He also described the use of tongue and groove parting lines injected with plastic sealers as a means of sealing coreboxes to blowheads.

The speaker believes that the reported trend of heavy industry back to the use of castings is due to a great extent to new developments in patternmaking, and he also is of the opinion that for consistently fine cast production, the patternmaker must assume the duty of liaison between the engineer and molder, since it is generally the patternmaker who has close contact with both groups.

J. W. Costello, American Hoist & Derrick Co., St. Paul, reported that three pattern apprentices and two molding apprentices from the Twin City area have entered the 1954 national apprentice contest being held in conjunction with the national AFS convention in Cleveland.—*R. J. Mulligan, Archer-Daniels-Midland Co.*

Wisconsin

THE Jan. 8 meeting of Wisconsin Chapter of the AFS was designated Management Night. R. S. Stevenson, executive vice president, Allis-Chalmers Mfg. Co., was the speaker, his talk being entitled "Where Do We Fit into the Picture?" in which he analyzed what lies ahead for foundries and other industries during the coming year.

Mr. Stevenson spoke of the important position the foundry industry occupies in relation with other industries of the country, and because it is basic, foundry business probably will show a trend similar to that of other industries of like importance.—*John E. Hubel*

Western New York

TWO speakers were featured at the Feb. 5 meeting of Western New York Chapter of the AFS at Hotel Sheraton, Buffalo.

The first was Kenneth S. Cowlin, sales manager of the Grinding Wheel Division, Electro Refractories & Abra-

(*Continued on page* 222)

WESTERN NEW YORK Chapter of the AFS held a dinner dance Jan. 16 at the Buffalo Trap and Field Club. Left to right at the speaker's table are Mr. and Mrs. William A. McClellan, Olean, N. Y., and Mrs. A. J. Heysel; Mrs. Erwin Deutschlander; Mr. Deutschlander; Mr. Heysel, Mr. and Mrs. Ronald E. Turner; and Mr. and Mrs. Alfred E. Diebold. Photo is by courtesy of Jack Heysel, E. J. Woodison Co.

Produce more
shell-molds per hour
with RCI's
FOUNDREZ 7500

When you make shell-molds with Reichhold's two-stage, thermosetting, powdered phenolic resin — FOUNDREZ 7500, you get more molds per hour. Molds made with FOUNDREZ 7500 are structurally stronger, with greater gas-venting ability and freedom from distortion. They produce castings that are practically carbon copies of the actual pattern surface . . . even in finely-detailed, thin-walled areas.

So accurate they need almost no machining, these castings save you labor and reduce rejects.

An outstanding advantage of FOUNDREZ 7500 is its performance under high oven temperatures, which speeds up the curing time.

For large and small parts cast with any ferrous or non-ferrous material, shell-molding with FOUNDREZ 7500 is ideal, particularly for long production runs.

Technical help is available from RCI. Get complete data by writing for Technical Bulletin F-3.

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Creative Chemistry . . .
Your Partner
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Synthetic Resins
Chemical Colors
Phenol
Glycerine
Phthalic Anhydride
Maleic Anhydride
Sodium Sulfate
Sodium Sulfite

The foundryman unclamps the pattern plate from the dump box. Notice the thin shell of partially-cured FOUNDREZ 7500 and sand clinging to the plate.

(*Continued from page* 220)

sives Corp., Buffalo, N. Y. Mr. Cowlin stated that the first grinding wheels were sold about the time of the Civil War and then explained the differences and features of various types of grinding wheels. He also described the code markings on abrasive wheels and offered a number of suggestions to reduce grinding wheel costs.

A. Lesley Gardner, advertising manager of Pangborn Corp., Hagerstown, Md., the second speaker, covered the history, engineering and maintenance of blasting equipment. This he illustrated with a chalk talk. In addition, he covered dust collection resulting from the blasting operation.—*R. E. Walsh, Hickman, Williams & Co.*

Philadelphia

AT the February meeting of Philadelphia Chapter of the AFS, 100 members and guests enjoyed a talk by Ralph White, Research and Development Department, International Nickel Co. Inc., who discussed "Carbon Control in Basic Lined Cupola." Harold Ullrich, Sacks-Barlow Foundries Inc., Newark, N. J., served as technical chairman.

The chapter's May 21 meeting, to be held at the Engineers Club, Philadelphia, will feature a talk entitled "The 'C' Process and 'D' Process," to be given by Harry Day, Auto Specialties Co., St. Joseph, Mich.—*Charles R. Sweeny, Atlantic Steel Castings Co.*

Ontario

THE Feb. 26 meeting of Ontario Chapter of the AFS was held at the Royal York Hotel, Toronto, and two groups of men were honored as "Kings for the Night." Special tables were decorated with crowns for those men who have served the industry for 50 years or more. Others honored were the past chairmen of the chapter.

Norman Bennett, Canadian General Electric Co., introduced the technical speaker, C. B. Schureman, Baroid Sales Division, National Lead Co., Chicago. Mr. Schureman's talk, "How About Becoming Sand Conscious," dealt with the proper choice of base silica sand, and the proper application of bond and water. In choosing the base silica sand the finish requirements dictate the grain size to be used. The size and amount of screen retention of the largest grains are the factors that determine the finish obtainable with any particular sand.

Permeability is controlled by the fines content. Where core sands left in the base sand are present in any appreciable quantities, it is essential that the core sand used be in balance with that of the heap, or control will undoubtedly prove to be impossible.

Bonding material is governed by the type and size of castings being made. Large, heavy castings cannot be properly made using a bond with a low hot strength. Similarly, light intricate work does not lend itself to using a bond with a high hot strength.

PHILADELPHIA Chapter of the AFS was addressed at the January meeting by Chester V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp. Left to right above are W. D. Bryden, Philadelphia Bronze & Brass Corp., chapter chairman; Mr. Nass; Walter S. Giele, Walter S. Giele Co., Lebanon, Pa., technical chairman; and Daniel E. Best, Bethlehem Steel Co., Bethlehem, Pa. Left to right below, at the February meeting, are Bonnie A. Miller, Crown Non-Ferrous Foundry Inc.; Harold Ullrich, Sacks-Barlow Foundries Inc.; Bernard Ames, Doran Manganese Bronze Co., Brooklyn, N. Y.; Ralph White, International Nickel Co., speaker for the evening; and Bert Troy, director of the chapter. Photos are by courtesy of Leo Houser, Dodge Steel Co.

Sand Mixing Is Important

Sand mixing is probably the most important function in any foundry. Mixes which are correct as laid down on paper can be distorted by poor weighing, inaccurate measuring of additions, poor sequence of additions and over or under mulling. If the sand has gone sour from any one or combination of these inaccuracies, no one will realize the trouble, and while everyone will maintain that "nothing has been changed," in reality nothing is the same. Testing and the results of any or all tests will be useless unless correlated and acted upon accordingly.

Moisture is of prime importance and must be controlled, since with 4 per cent moisture, 14.5 cu in. of water vapor is driven off each square inch of mold surface and it can be a real problem if not handled properly.

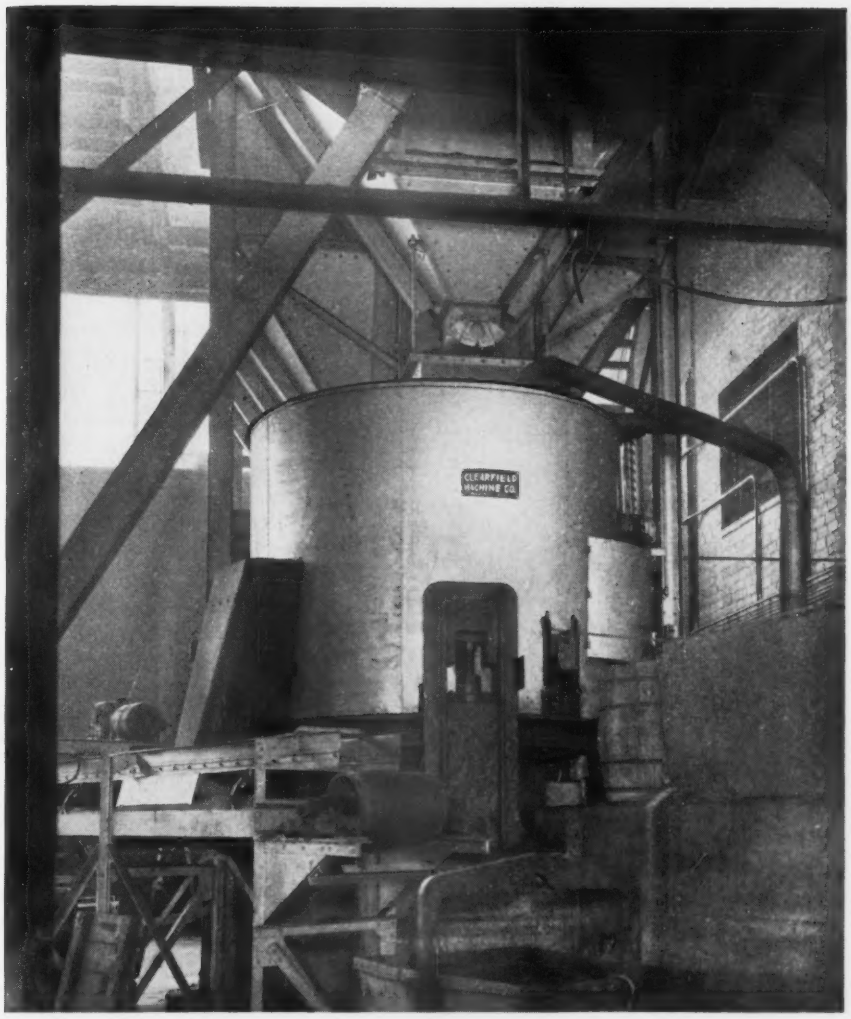
Expansion of the base sand is a function of temperature and must be counteracted by any one or combination of methods. These may include organic additions, fines content, moisture, type and quantity of bond, mixing, mold hardness, grain size and metal temperature. With the number of variables, it is obvious expansion is not the simplest job to lick.

Mr. Schureman does not believe one sand can be made to do every job in any foundry, and he advocates the use of facing sands that will suit the job and render the fin-

(*Concluded on page* 224)

you get better foundry sand from a

CLEARFIELD MIXER



This Clearfield 930 Mixer is the center of a complete molding sand conditioning system.

Sand which adheres firmly during both molding and pouring operations must have bond and moisture uniformly distributed. This is absolutely essential for good foundry work—and that's the type of sand which is turned out all the time by Clearfield Mixers

Clearfield Mixers, with the famous revolving pan and vertically rotating mullers, are available in sizes and models to fit in perfectly with any production setup. So whether your needs are for small quantities of sand at infrequent intervals or a continuous large supply, write for Catalog No. 83 for complete information on the Clearfield Mixer which you require.

CLEARFIELD MIXER

MIXES, TEMPERS AERATES

CLEARFIELD MACHINE COMPANY

CLEARFIELD PENNSYLVANIA U.S.A.

(*Concluded from page* 222)

ish required.

With regard to sand handling systems, the speaker stressed four fundamentals: Flexibility, adequate capacity; perfect screening; and good cooling. He then implored all present to stop blaming the sand for all their troubles. "If you will become more sand conscious, you will not be plagued by problems that you will blame on the sand."—*William H. L. Bryce, International Harvester Co. of Canada Ltd.*

Metropolitan Brass Founders

ELECTION of officers to serve the Metropolitan Brass Founders' Association during 1954 was held on Jan. 13. Jack Friedman, Bronx Foundry Inc., was re-elected president. Vice president is Raymond Bietry, B & S Bronze Foundry Inc. and secretary-treasurer, John C. Spring, Modern Art Foundry Inc.

Bernard G. Walsh, Continental Assurance Co., answered questions pertaining to the new Non-Ferrous Founders' Society's insurance fund that were asked by members.

Special guests of the chapter at the Feb. 10 meeting of the Metropolitan Brass Founders' Association were several members of the local Pattern Makers Association. Featured at the meeting was a film entitled "Pressure Cast Matchplates," which proved to be very educational.

Also present at the meeting was James W. Wolfe, executive secretary of the Non-Ferrous Founders' Society, Chicago, to explain further the recently introduced insurance fund of the society.

The association has obtained the Ford Motor Co. film, "Technique for Tomorrow" illustrating operations at the Cleveland Ford Foundry for showing at its Apr. 13 meeting.—*George Staub.*

Reading

ROUNDTABLE discussions were arranged for members of the Reading Foundrymen's Association attending the Feb. 17 meeting. James Woodward, Excelsior Brass Works, president of the association, presided at the dinner.

The 78 members and guests present adjourned to separate rooms for the discussion period. Those interested in gray iron practice had Walter R. Jaeschke, Whiting Corp., Harvey, Ill., as speaker. His talk was supplemented by slides and a motion picture and dealt principally with cupola operation.

Raymond Cochran, R. Lavin & Sons Inc., Chicago, was the speaker for the nonferrous group. Those interested in steel casting production had as their speaker J. J. Blauch, one of several men who have recently organized the Quaker Alloy Casting Co., Myerstown, Pa.—*William I. Cassidy*

MICHIGAN STATE COLLEGE Chapter of the AFS held a joint meeting with the college chapter of the American Society for Metals on Feb. 11. Left to right are Edward Lahnala, student member; Bruce Harding, chapter chairman; and Vernon Patterson, metallurgist, Climax Molybdenum Co., Detroit, speaker

ASTM Annual Meeting To Be Held in Chicago

American Society for Testing Materials will hold its 57th annual meeting at Chicago, June 13-18, for the first time since 1941. Hotels Sherman and Morrison will be headquarters with the 11th exhibit of testing and scientific apparatus and laboratory supplies being housed at the Sherman. Technical sessions will include, in addition to presentation of numerous papers on materials and testing, six symposiums sponsored by various committees of the society.

One on "Effect of Cyclic Heating and Stressing of Metals at Elevated Temperatures" will be under direction of the Joint Committee on Effect of Temperature. Another on "Temperature Classification of Insulating Material" will be sponsored by Committee D-9 on Electrical Insulating Materials. Third on "Coal Sampling" will be directed by Committee D-5 on Coal and Coke. Fourth on "Odor" will be sponsored by Committee D-22 on Methods of Atmospheric Sampling and Analysis. "Permeability of Soils" will be under the direction of Committee D-18 on Soils for Engineering Purposes, and "Improved Construction and Performance" will be sponsored by Committee E-6 on Methods of Testing Building Constructions.

Marburg lecturer this year will be Harold F. Dodge, Bell Telephone Laboratories, while the Gillett lecture will be presented by Richard L. Templin, Aluminum Co. of America. A photographic display and competition also will be held in conjunction with the meeting.

MIT Plans Summer Study of Corrosion Problems

A one-week summer program on corrosion, to summarize the fundamental and recent advances in this field, will be given at Massachusetts Institute of Technology, Cambridge, Mass., June 21-25.

The program will include a presentation of fundamentals of corrosion reaction and control, followed by consideration and discussion of proper selection of corrosion resistant materials, chemical treatment of the environments, theory and practice of cathodic protection, selection of coatings and alloys economically feasible for reducing corrosion losses, and corrosion testing.

Tuition will be $100. Further information and application blanks are available from the summer session office, Room 7-103, Massachusetts Institute of Technology.

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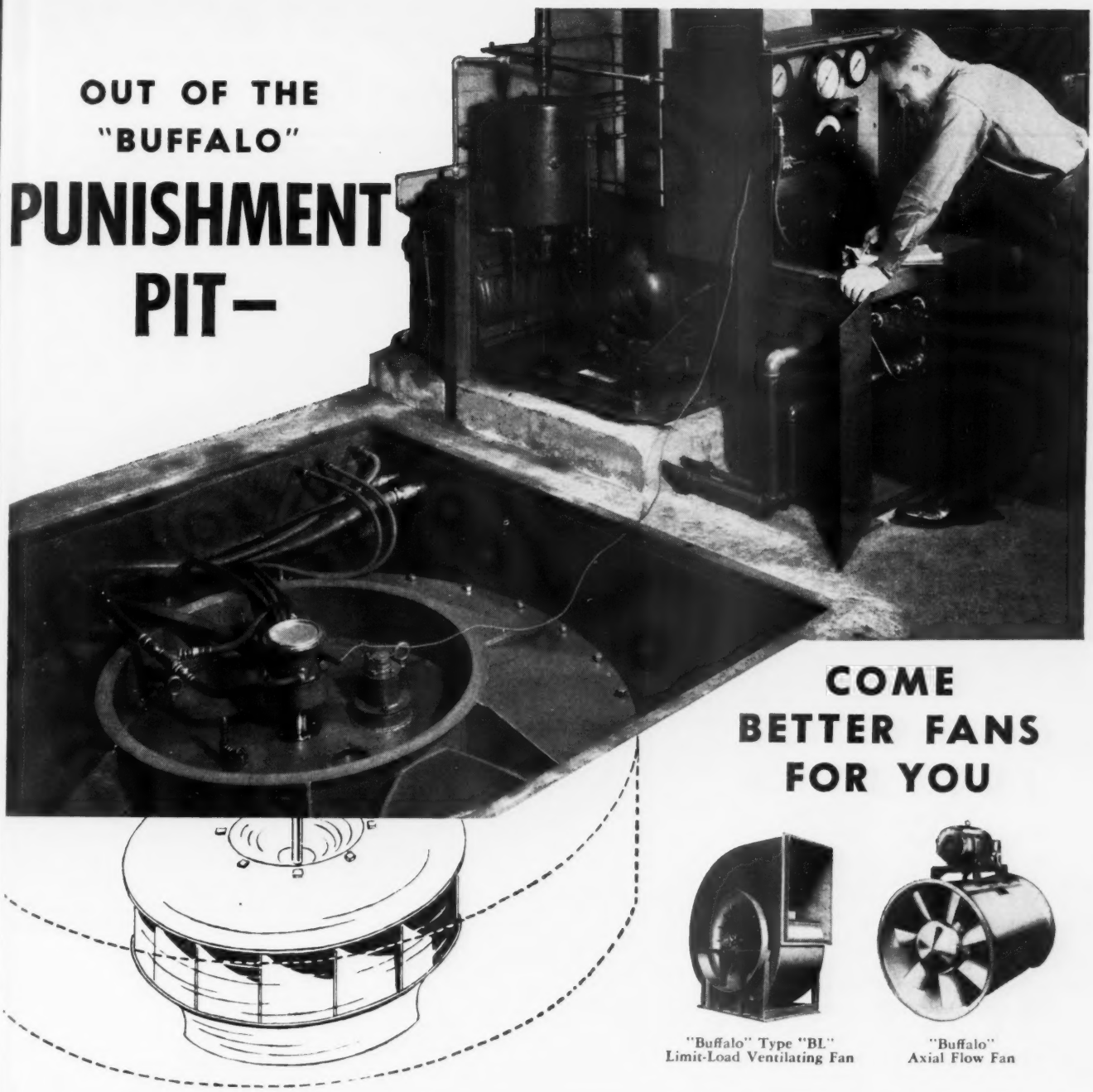

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A B C of Foundry Practice

By T. H. TREVITHICK

Principles of Refractories

FEW realize that, to the foundryman, refractories rank second in importance to the metal itself. Satisfactory metal cannot be produced without the use and knowledge of proper refractory materials and, even after good metal is produced, it can easily be spoiled as a casting after it is poured into the mold.

In the first place, the foundryman has to take into account the effects of what the chemists call compounds which dissociate in aqueous solutions with production of hydrogen irons, and hydroxides of positive elements or radicals, in his melting practice. These are acids and bases, and the improper use of them in melting equipment means trouble.

Lining Is a Factor—In the early days of steelmaking, it was almost impossible to make two heats alike because the significance of acid and basic linings was not properly understood. In places where low-phosphorus iron ore was unobtainable, as in some countries of Europe and in the southern part of the United States, the real difficulty in making steel was to control the phosphorus, since basic materials were required to remove that element. In the iron foundry, when the bricks in a cupola are "cut back" badly after a particular heat, the foundryman knows that a basic slag has attacked the silica in the brick lining.

Basic refractories are used less in the iron foundry than in the steel foundry, and the melting refractory problems are not as complicated. But it is important that they be controlled and, in order to be controlled, the cause and effects must be understood.

Neutralize Each Other—When the proper amounts of two substances like acids and bases react with each other they form neutral substances or salts. In other words, they cancel each other. Fire clay neutralized by nature through combination of alumina and silica (basic and acid substances) is used for patching cupolas and bonding firebrick. Carbon, in all its forms, is a neutral substance. Neutral slags are formed by combining acids with bases; in fact, most materials in the foundry industry are formed by the combination of acids and bases and thus become neutral substances. It is a good thing to remember that all acids are nonmetallic substances.

It will be seen then that, in the foundry, the nature of the materials used in producing castings must be understood. Such substances as alumina, lime and magnesia are basic and are used as furnace linings to neutralize the acids in the melt. Silicas, ganister and flints are acid. When these are used as furnace refractories, they have little or no effect on the acids in the metal.

It is necessary, therefore, to keep the acids—phosphorus and sulphur—down when using silica-containing brick or silica sand refractories in the cupola. It is for this reason that when melting cast iron, the foundryman desires low phosphorus and low sulphur in his pig iron.

Sand Grains Vary—Pure silica sand, and acid, is quartz broken down by nature over long periods of time into sand grains. Some of these are rounded by friction and erosion. The sands found in different parts of the country vary in shape and in purity. It is obvious that the best sands are required for furnace refractories.

In forming these sand grains into bricks, a fluxing material is added to bond the grains, so clays and lime are added. While the mass is plastic, bricks are formed, placed in ovens, subjected to temperatures high enough to fuse the mass together, then slowly cooled and sorted as to grade. The best of these must stand furnace temperatures up to 3000° F.

On the other hand, the basic type of furnace refractories are made up of basic materials such as magnesite and burned dolomite, which is a natural rock composed of magnesium and calcium carbonates with small amounts of alumina, silica and other oxides. The burning is done to eliminate the carbon dioxide from the material.

Molds Are Refractory — Although melting and heat treating furnaces are commonly considered as the principal applications for refractories, molding sands, too, must possess refractory properties to resist the molten metals poured into the molds. The refractory properties of the material are the most important. Second in importance is the porosity of the sand to permit the passage of gases, although the bond strength is also a vital factor to be considered.

The mold must be able to withstand high temperature until the metal has set. The silica grains do this. The coating of clay around the grains must resist breaking down, at least until the metal has set. Natural sand has this clay deposited around the sand grains, but sometimes its uniformity and heat resisting ability cannot be depended upon when high temperatures are used. For this reason, clay-free silica sand grains are mixed mechanically with a uniform amount of binder of the required quality. This is called "synthetic" sand by the trade and is used both for cores and molds.

After pouring, gases generated by the molten metal in contact with the sand must be liberated. This ability or property of a refractory to permit passage of gases is called "permeability." The more uniform the sand grains for a given size the better the permeability; also, the stronger the clay the better, since smaller amounts then are needed to bond the sand grains.

As the casting should leave the mold with a smooth surface, the best combination of sand and bond should be next to the casting proper. The thickness of this special mixture of molding sand is kept to a minimum on the face of the mold and is called "facing sand."

The requisite of good foundry practice, therefore, is largely governed by the knowledge and proper use of refractories.

Naturally Bonded Sand—Naturally bonded sand, the principal type used for molding purposes, is found in numerous areas of the country. One large deposit in the Albany, N. Y., area is known as "Albany molding sand" and is used all over the country in gray iron, malleable and nonferrous foundries.

Naturally bonded sand usually is found beneath the top soil layer, in stratas or layers of various depths, and may vary in uniformity both in grain size and quality. The field operations conducted by the various sand companies consist of laboratory tests of all the properties that go to make up the qualities of the sand for the purpose intended. In many cases the sand companies blend various sands together to provide one possessing the desired proper-

(*Continued on page* 228)

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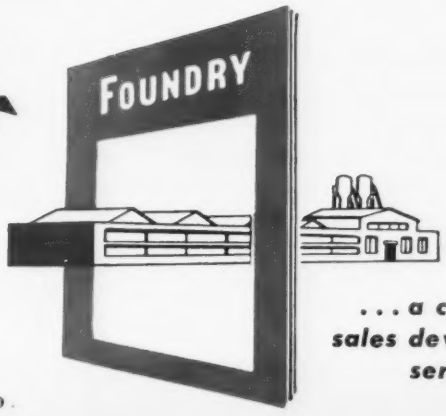

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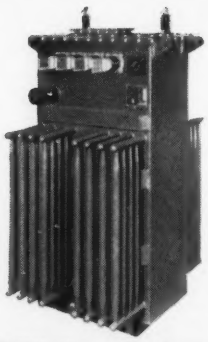
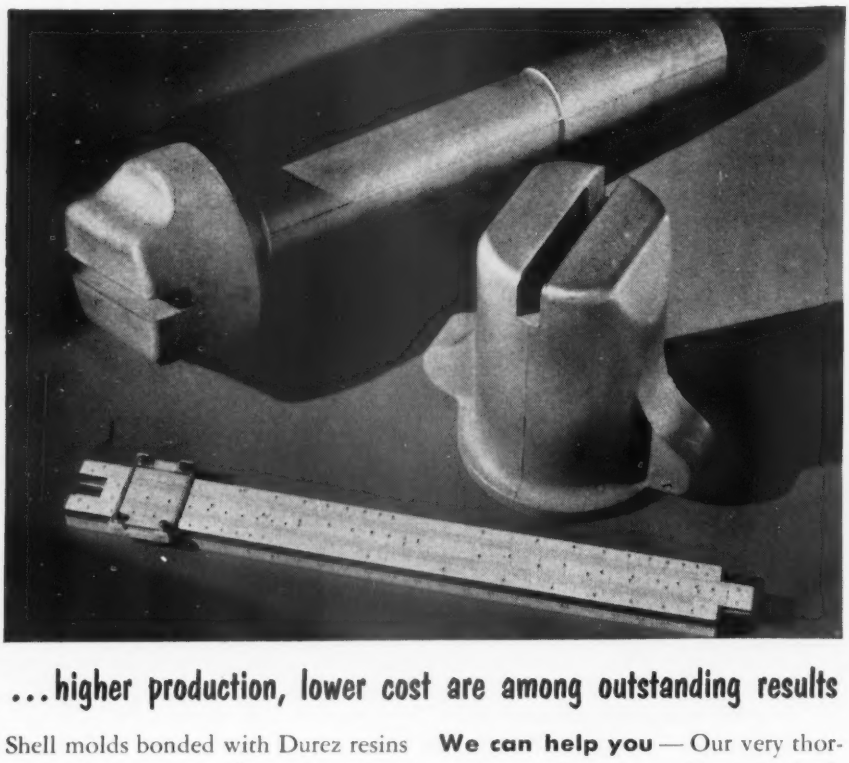


500KVA Niagara Transformer



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Phenolic Resins for the New Competitive Era

(*Continued from page* 226)

ties for making satisfactory molds.

These qualities, all important in molding sand, consist of refractory properties, bond, permeability, and fineness (size of grain). The three predominating constituents in green molding sand are silica, clay and feldspar.

Silica is the refractory or heat resisting material and in itself has no bonding properties, but when tempered with water, does possess a certain cohesiveness. This is due to surface tension.

Alumina and silica unite to form clay. Pure clay, technically known as kaolin, consists of silicate of alumina in hydrated form, known to chemists by the formula $2SiO_2 \cdot Al_2O_3 \cdot 2H_2O$.

The feldspars in natural bonded sands can be seen as clear transparent particles, although sometimes they may be opaque or colored. They consist of silicate of alumina, potash and soda, and are fusible. Sands containing excess percentages of feldspar do not have such high refractory properties and should not be used when subjected to high casting temperatures.

Heat Dehydrates Clay

In all clays water is present in chemical combination. This is known as "combined water." When clays containing an excess of combined water are subjected to high temperatures, they become dehydrated, causing the mass to shrink. This shrinkage, in turn, causes the mold to crack. It is chiefly for this reason that the naturally bonded sands often are not adaptable to the larger type of castings or where metals in the higher temperature ranges are used, such as in steel foundries.

In addition to the above, naturally bonded sands will contain varying amounts of organic matter, lime and small percentages of iron oxide. As these are considered contaminations, especially the organic matter, minimum amounts are permissible in good quality natural molding sands and it is because of this fact that only certain sand deposits, such as Albany sand, are suitable for foundry use.

Natural sands are graded also according to grain size. These grades run from the very fine to quite coarse, sometimes referred to as "gravels." The fine grain size is used for small castings requiring a fine surface finish up to the coarser grades for larger castings where refractory strength and high permeability are the particularly important considerations.

This type of green sand is used

extensively in mass production foundries making small castings in gray iron, malleable and nonferrous castings, as the molds can be poured immediately after they are made.

Synthetic Sands—Synthetic sands are resorted to when especially high refractory qualities are necessary and (or) where uniformity of bond strength and permeability is necessary. They are chiefly applied to steel foundries or where molds are subjected to higher temperatures and pressures.

In synthetic sand practice the bonding material is applied in specified amounts to an almost pure silica sand of a definite fineness which contains little or no moisture and has no bond, such as is found on the sea or lake shores, sometimes called sharp sand.

This sand, like the sand found in natural deposits, is selected for its purity and uniformity of grain size and shipped to the foundries by the suppliers after proper grading and sorting.

Establishes Laboratory

Marietta Concrete Corp., Marietta, O. has established a new research and product development laboratory at its main plant in Marietta. The new laboratory, under direction of Robert B. Hindman, is housed in a one-story building containing about 1000 sq ft of floor space. Equipment installed in the laboratory will enable the company to maintain continuous quality control of all its manufactured products.

Book Review

Rolling Mills, Rolls and Roll Making, cloth, 108 pages, 8¾ x 11½ in., published by Machintosh-Hemphill Co., 901 Bingham St., Pittsburgh 3, Price $5.

Beginning with man's early efforts to form metals by casting and hammering into shapes this book describes the origin of rolling such metals as gold, silver and lead, and the gradual expansion into the iron and steel field.

After discussing the change from hand to electric power for operation of the rolls, the text describes the beginnings of modern rolling, rolling in the United States, and the story of rolls. Remainder of the book is devoted to rollmaking in this country, the formation of the present Mackintosh-Hemphill company, and excellent description of manufacture of cast iron and steel rolls as practiced by the firm. Last few pages of the book are devoted to illustrations of typical modern rolls.

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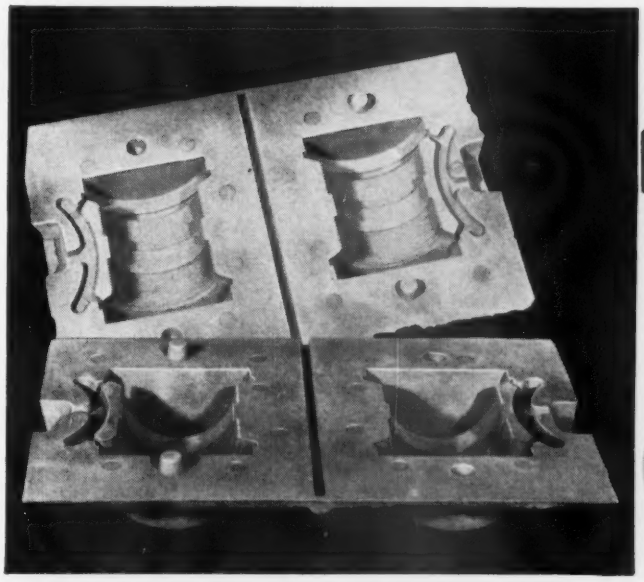

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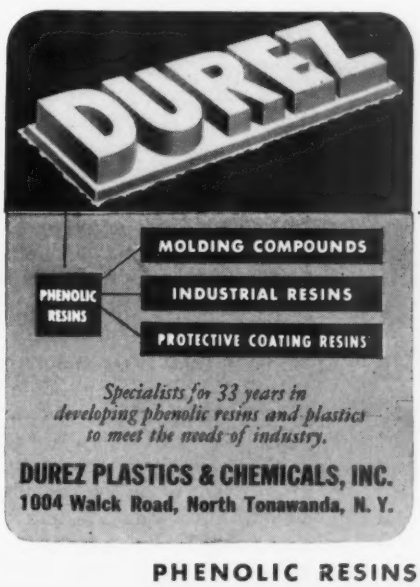
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New EQUIPMENT an

Sand Muller: National Engineering Co., Dept. F, 549 West Washington Blvd., Chicago 6—New 500-lb capacity sand muller just added to the company's line is said to have about 50 per cent greater productive capacity than present, comparable models of the same make. Similar in design to the firm's 2000 and 4000-lb capacity mullers, the new unit is equipped with V-belt drive, central funnel for liquid additions and with spring loaded mullers having adjustable pressure range of from 200 to 500 lb. Helical gear reducer operates in oil. The V-belt drive is accessible through a removable hatch. Unit is powered by a standard NEMA frame, 7½-hp, 1800-rpm, integral mounted motor.

For More Details Circle No. 1—Page 235

Sheet Wax: Kindt-Collins Co., 12651 Elmwood Ave., Cleveland 11—Sheet wax with a pressure-sensitive adhesive backing for attaching to all surfaces sticks to any clean, oilfree surface and can be used over and over again if not damaged. It is available in all thicknesses from 0.007 in. up to 8 x 12 and 12 x 24 in. standard sheets. Softening point of the wax is 166 to 168° F, with special formulations available to 270°.

For More Details Circle No. 2—Page 235

Profile Template: Toolcraft Mfg. Co., P. O. Box 507, East Chicago, Ind.— New 12-in. profile template reportedly makes it possible to obtain both a male and a female profile of objects 12 in. long and with 4 in. depth of contour in a matter of seconds. It uses brass strips 0.010 in. thick. Additional adjustment and locking force have been incorporated by the use of a right and left hand threaded member to apply pressure on both ends at once. The firm also manufactures a 6-in. instrument.

For More Details Circle No. 3—Page 235

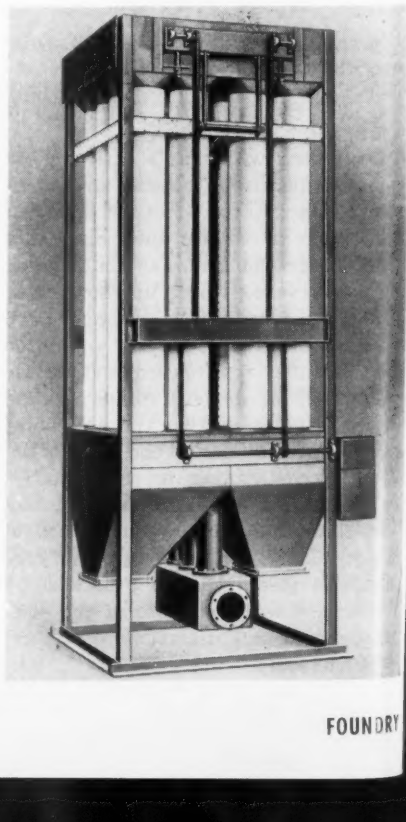
Barrel Finishing Chips: Chicago Wheel & Mfg. Co., 1101 West Monroe St., Chicago 7—Precision barrel finishing chips, known as Novaculite, are claimed to have long life and to reach hard-to-get-at indentations without wedging or clogging holes or changing the work. In addition, they reportedly produce fine finish to close tolerances, with uniform radii on all edges of the work. They do not charge work with abrasives or extraneous materials and do not create dents, burrs or other damage to cast parts, according to the manufacturer.

For More Details Circle No. 4—Page 235

Ophthalmic Frame: Zylo Ware Corp., 11-15 47th Ave., Long Island City 1, N. Y.—Protective ophthalmic glasses consist of a twin frame that incorporates a frame with temples plus a twin front that snaps on or off the frame. Protective plano lenses are used in the twin front, the worker's prescription lenses in the frame itself.

For More Details Circle No. 5—Page 235

Dust Collector: American Air Filter Co., 266 Central Ave., Louisville 8, Ky.—Reverse jet fabric dust collector is designed for applications which involve extremely fine particles or the dry collection of material which is to be reclaimed. A jet of high-pressure air forced through the cloth in the opposite direction to the flow of air being cleaned automatically reconditions the cleaning media. Continuous cleaning cycle enables the unit to maintain a constant pressure drop and a steady air volume at the



SUPPLIES

For More Details on these Items
Use Reply Card—Page 235

exhaust points. Since this method of media reconditioning permits high velocities through the cleaning tubes, less filter cloth is said to be needed for any given cfm than is customary, thus reducing the size of the collector.

For More Details Circle No. 6—Page 235

Pattern Plate: General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif. — Aluminum pattern

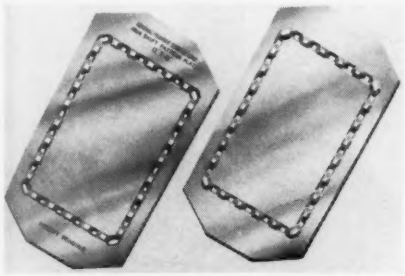


plate is designed to give automatic and positive sand-to-sand lock around the entire perimeter of a mold without the use of cores, mold anchors, steel balls or other material. Shifts are said to be reduced to a minimum with no reduction in pattern area. Plates are available in a variety of sizes in ⅜, 7/16 and ½-in. thicknesses.

For More Details Circle No. 7—Page 235

Core Paste: Frederic B. Stevens Inc., 1800 Eighteenth St., Detroit 16—This new core paste is said to offer exceptional tensile strength, low gas evolution, good "green grab" and fast drying. Regardless of how it is applied, light pressure will spread the paste and compress it to a very thin joint when the top half-core is set in place. If stored in a reasonably dry place, pasted cores can be held for weeks without appreciable weakening of the pasted joint. Possibility of core shifts is reduced also, it is claimed. Either hand or mechanical mixing produces lumpfree paste quickly and easily. The product is packed in 470-lb fiber drums and in 100-lb multiwall paper bags.

For More Details Circle No. 8—Page 235

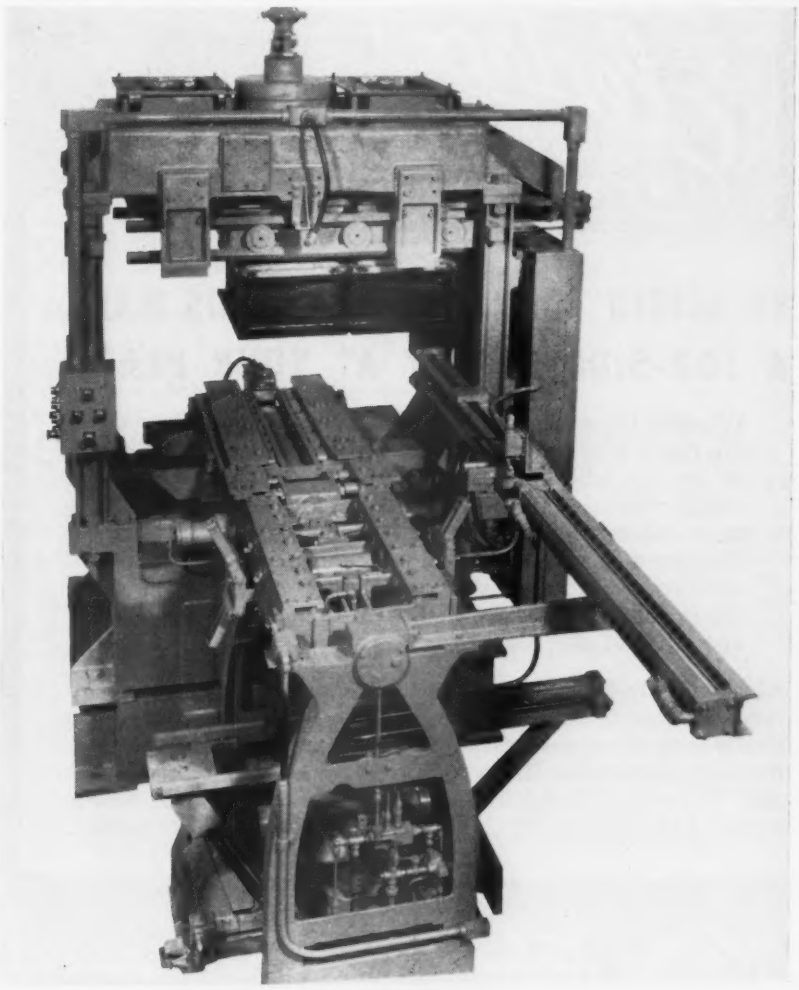
Inspection: Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31—Conveyorized auxiliary production unit for small and medium sized parts can be used in conjunction with any standard stationary Magnaflux unit to provide high volume inspection at low cost, according to the manufacturer. With the addition of the conveyorized unit, one operator is said to be able to supply either two or four inspectors, doubling or even quadrupling production rate of the standard unit. The unit also is reported to smooth out the work flow and, in process control, to reduce processing time. Operation involves magnetizing a part and placing it on

Dual-Head Machine Blows Two Cores at Once

AUTOMATIC, dual-head core blower is stated to provide up to 400 blows per hour. Cores of different sizes can be blown simultaneously, even when made of different sand mixtures, or the unit can be used as a single head blower, on either head. Because there are two refill stations, one head can blow while the other is filling. Sand chambers have large refill openings with negative draft on all sides to assure positive sand flow.

Integral air reservoir provides an immediate release of compressed air when a core is blown and also compensates for fluctuations in line pressure. Entire cycle is pushbutton controlled and can be operated either manually or automatically. Maximum corebox size is 12 in. deep, 15¾ wide and 36 in. long. Manufacturer is Sutter Products Co., 2005 Westwood Ave., Dearborn, Mich.

For More Details Circle No. 9—Page 235



Portable Air Grinder, fitted with Electro Type 11 Flaring Cup 6" resin grinding wheel.
Stand Grinder fitted with Electro Grinding Wheel. All three views taken at the Riverside Foundry, Bettendorf, Iowa.
Swing Frame Grinder fitted with Electro 24x3x12 resin Grinding Wheel.
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Electro Refractories & Abrasives

the conveyor. The auxiliary production unit carries the part through a bath application station to the inspectors, who remove unacceptable parts. Acceptable parts then are carried through the demagnetizing process to the end of the inspection cycle.

For More Details Circle No. 10—Page 235

Refractory Gun: Vibron Division, Burgess-Sterbentz Corp., 3790 West 150th St., Cleveland 11—Compact pneumatic refractory gun is designed to reduce the cost of many

time-consuming, hand applied refractory jobs in small ladles and other confined places. Manufacturer claims that refractories can be applied with 40 to 50 per cent less moisture, thus producing longer lasting refractory linings or patches. Powerful, high-frequency stroke is achieved by a reciprocating piston actuated by compressed air. The design provides automatic cycling, a high frequency of 4800 strokes per minute and quiet action. The gun weighs 5 lb and operates at greatest efficiency between 85 to 130 psi.

For More Details Circle No. 11—Page 235

Hand Cleaner: West Disinfecting Co., Long Island City, N. Y.—Antiseptic waterless hand cleaner for use on the job cleans workers' hands and offers added protection to people with naturally dry or sensitive skins who may be allergic to soaps containing petroleum solvents. It is available with built-in antiseptic properties (2 per cent hexachlorophene). Made from vegetable oils converted by sulphonation into mulsifying agents, it also contains a relatively high amount of unsulphonated vegetable oil which acts as an emollient and keeps skin from becoming defatted.

For More Details Circle No. 12—Page 235

Liquid Tooling Resins: Houghton Laboratories Inc., Olean, N. Y.—Liquid resins are used in combination

(*Continued on page* 237)

HELPFUL IDEAS FOR FOUNDRYMEN

HERE ARE QUICK REVIEWS OF NEW LITERATURE—available to foundrymen as "idea" and reference information. Readers in the United States and Canada may obtain copies by using the attached cards. Readers in foreign countries should write direct to the manufacturer offering literature.

61. Shielded Arc Electrodes

Harnischfeger Corp., 4400 W. National Ave., Milwaukee 46, Wis.—56 pages of pocket size booklet "P & H Shielded Arc Welding Electrodes" contain data on electrodes for welding mild steels, cast iron, alloy steel, stainless steel and for hard surfacing. Applications, characteristics, available sizes and current information are detailed.

62. Mobile Cranes

Hughes-Keenan Corp., Delaware, O. —How the V model Roustabout mobile crane is made, descriptions of its design features and complete specifications are found in 24-page brochure. Crane is easily maneuvered and easy to operate. Optional equipment is available.

63. Melting Furnaces

Lindberg Engineering Co., 2450 W. Hubbard St., Chicago 12, Ill.—Melting and holding furnaces described in 12-page bulletin 551 include floor mounted and pit crucible types, a two-chamber induction model, rotary open-flame smelting furnaces, powered and hand-tilt crucibles and an iron pot furnace.

64. Dual Wash Fountains

Bradley Washfountain Co., 2203 W. Michigan St., Milwaukee 1, Wis.—Suitable for small washrooms in factories, stores, offices and institutions, Duo-Washfountains are described and illustrated in 4-page folder K958. Compact unit is large enough to serve two persons.

65. Grinding Manual

Cleveland Quarries Co., Sterling Abrasives Div., Tiffin, O.—"Art and Science of Grinding", now in its sixth edition, is pocket size manual containing 44 pages of illustrated information on grinding wheels and correct grinding practices. Tabulated are peripheral speeds, recommended operating speeds, and spindle diameters. Many other technical data of use to operators and foremen are also given.

66. Radiant-Tube Heating

Holcroft & Co., 6445 Epworth Blvd., Detroit 10, Mich.—Radiant-tube heating of controlled atmosphere heat treat furnaces is subject of 8-page illustrated bulletin 3-M S.N.P. Gas fired, oil fired, electric and quick conversion tubes are discussed. Design factors and other considerations for selection of any of these are given.

67. Sand & Core Testing

Claud S. Gordon Co., 3000 S. Wallace St., Chicago 16, Ill.—Series of nine ring-punched data sheets describe a moisture tester, permeability tester, combination rammer-compression tester, core hardness tester, transverse test core maker, sample collector, utility mixer, transfer core tester and a sand washer.

68. Materials Handling

American Hoist & Derrick Co., 63 S. Robert, St. Paul 1, Minn.—Locomotive cranes, hoists, portable material elevators, car pullers, blocks and sheaves and wire rope clips are among the products for materials handling shown in well-illustrated 32-page catalog GC-2A. Units are pictured and described briefly in captions.

69. Molding Machines

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa. —Including jolt, rollover, charging conveyor and draw, centrifugal casting and jolt strip type units, eleven different molding machines are pictured and described in 24-page illustrated catalog GC-11-53. Units are available in types and sizes to fit any foundry operation.

70. Magnetic Inspection Unit

Sonoflux Corp., 6211 Edloe, Houston, Texas—The Sonoflux vibro-magnetic inspection unit for detecting surface flaws in ferro-magnetic materials provides for portable magnetic particle inspection with no residual magnetism. Unit is described and several applications illustrated in 4-page brochure.

71. Industrial Ovens

Newcomb-Detroit Co., 5741 Russell, Detroit 11, Mich.—16-page illustrated bulletin D-53-20 shows line of ovens including designs for any industrial heating requirement. Steam, gas, oil and electrical heating systems are explained together with various air circulating methods, heat controls, heat distribution systems and oven types.

72. V-Belt Drives

Flexible Steel Lacing Co., 4667 Lexington St., Chicago 44, Ill.—Open-end v-belting, fasteners, tools and conveyor belting and cutters are described and illustrated in bulletins V-215A, BC-300 and A-70. V-belting is suitable for A, B, C, and D drives. Complete ordering information is given on all items.

73. Mold Release Spray

Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, O.—Silicone spray mold release described in data sheet is dispensed from a pressurized container and gives a uniform non-spotting mold cavity. Spray can valve is removable and can be cleaned. Data sheet gives complete description and lists prices.

74. Refractories & Mortars

Chicago Fire Brick Co., 1467 Elston Ave., Chicago 22, Ill.—Various types of castable refractories, cements and mortars are covered in available data sheets. Refractories are available for service limits up to 2700° F

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies." "Trade Publications" or "Ideas for Foundrymen" in this issue—simply circle corresponding item numbers on accompanying cards

and cements and mortars include types for service exceeding 2000° F. Complete story is given on each product.

75. Hydraulic Boosters

Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill.—Fluid pressure boosters and accumulators are covered in 12-page illustrated bulletin B-200. Units have input ranges from 40 to 3000 psi air or fluid and output ranges of from 200 to 10,000 psi fluid. Complete engineering, installation, mounting and operation data are provided, and theory of application and recommended circuits are shown.

76. Cranes

Industrial Crane & Hoist Corp., 315 N. Ada St., Chicago 7, Ill.—Telescopic portable gantry cranes and single girder motor driven cranes are covered in illustrated bulletins P.G. 244-53 and MD-848. Gantry types have capacities up to 3 tons, powered units in both top running and underhung types have capacities up to 10,000 lb.

77. Sand Rammer Butts

Arrow Butt Co., 5148 Ridge Rd., Cleveland 29, O.—Various types of neoprene sand rammer butts in wide range of diameters, shapes and sizes are considered in 4-page illustrated bulletin. Construction details and dimensions are given.

78. Ferro Metals & Alloys

Electro Metallurgical Co., 30 42nd St., New York 17, N. Y.—104-page attractively illustrated catalog available to metallurgists and other qualified foundry personnel covers major Electromet ferro-alloys and metals. New products and improved specifications are included, and information on grades, analyses, and standard sizes of each product with data on properties and uses is given.

79. Steel Abrasive Shot

American Wheelabrator & Equipment Corp., Mishawaka, Ind.—"6 Steps to Greater Abrasive Savings" is title of 8-page illustrated bulletin 89-A giving details of steel abrasive shot used for peening and cleaning jobs. Complete diameter range is described as available. Manufacturing techniques used and close quality control are explained.

80. Chaplets

Fanner Mfg. Co., Brookside Park, Cleveland 1, O.—36-page illustrated catalog 1050 contains details on line of standard and special chaplets and chills, shows how to select correct type for any application and reference information on metals, weights of iron and steel standard gages, pattern metals, formulas and measurements.

81. Shell Molding Process

Monsanto Chemical Co., Plastics Div., Springfield, Mass.—In 36 illustrated pages, product information bulletin No. 77A gives background, summary, applications and limitations of the shell molding process. Data are also provided on equipment, materials, release and parting agents, binders and gating requirements.

Helpful IDEAS

82. Multipurpose Hand Tool

Aircraft-Marine Products, Inc., Harrisburg, Pa.—Hand tool designed for multiple uses shears bolts and screws cleanly, crimps solderless terminals and connectors, and cuts and strips wire. It is described in 8-page illustrated folder.

83. Pots & Molds

Acme Foundry Co., 2503 22nd St., Detroit 16, Mich.—Pots for melting ferrous metals, die cast pots for die cast machines and ingot molds are illustrated in available data sheet. Company has a complete range of standard sizes and shapes, and will fabricate any pot to desired specifications.

84. Hardness Testers

Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 21, Mich.—Brinell hardness testing machines are subject of 8-page illustrated bulletin B 953. Specifications and descriptions are given on a range of units including bench and floor mounted, motorized and portable types, and in addition a short treatise on correct testing practices is included.

85. Core Oils, Compounds

Pelron Corp., 7740 W. 47th St., Lyons, Ill.—Brief description of custom engineered core oils and standard Pelron core making compounds is offered in 4-page folder. Latter include binders, core washes and core pastes.

86. Vibration Mounting Pads

Fabreeka Products Co., 222 Summer St., Boston 10, Mass.—Eight principal characteristics of Fabreeka pads which explain their success in reducing destructive effects of impact shock, vibration and noise are highlighted in 4-page folder. Application of pads for mounting machinery, including forging hammers, and under bridge supporting plates is considered.

87. Core Extruders

Wadsworth Equipment Co., Akron, O.—Complete line of core extruder equipment receives descriptive treatment in 12-page illustrated brochure. Covered are hand, belt and motor driven core makers; a core cutting-off and coning machine; the Rapid core extruders; round core drying trays and core plates; and gagers. With standard equipment, the core machine will produce cores from ¾ to 7 in.

88. Air Control Products

Scovill Mfg. Co., A. Schrader's Son Div., 470 Vanderbilt Ave., Brooklyn 38, N. Y.—Couplers, blow buns, hose reels, strainers, lubricators, mufflers, hose and fittings, rotating joints, ferrule machines and regulators are among air control products cataloged in 4-page folder A280.

89. Refining Furnaces

Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh 30, Pa.—62-page brochure gives excellent pictorial and descriptive treatment of Moore Rapid Lectromelt furnaces for melting and refining of steel, iron, nickel and copper. Standard sizes are discussed in order of decreasing capacity, and data relative to each are given.

90. Dry Press Fire Brick

Ironton Fire Brick Co., Ironton, O.—Descriptive of Ironton Steel high-duty dry press fire brick, 4-page folder illustrates application in glass tank regenerator chambers, boiler furnaces, gas producer machinery, open hearth regenerator chambers, forging furnaces and incinerators.

91. Liquid Core Binder

Swan-Finch Oil Corp., 205 E. 42nd St., New York 17, N. Y.—Tykor liquid core binder reduces shake-out time and labor, increases oven capacity and cuts cleaning room costs, according to 4-page folder. Piece briefly describes Tykor binders and points up their advantages.

92. Core Box Vents

Andrea Mfg. Co., 180 N. Wacker Dr., Chicago 6, Ill.—Standard and special type core box vents are illustrated in 4-page folder. Size and price listing is provided.

93. Shakeouts

Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.—Construction of Foundromatic shakeouts in sizes from 3000 to 8000 and from 8000 to 300,000 lb capacity is described in 20-page bulletin 07B6365B. Larger units feature two-bearing construction and special pivoted motor base for maintaining proper belt ten-

For Foundrymen

sion. Tables help determine size and type and aid selection of shakeout deck openings.

94. Core Baking Ovens

Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich.—Model 608 core baking oven for test and small foundry cores and model 609 oven for large quantities of test specimens are described in 4-page folder. Former will hold forty 2 x 2-in. specimens and latter will hold 120. Temperature ranges are 250 to 500 and 250 to 600°F, respectively.

95. Bin Level Indicators

Bin-Dicator Co., 13946 Kercheval Ave., Detroit 15, Mich. — Various models of the Bin-Dicator automatic bin level indicator are diagrammed and described in 20-page form BD-5. Unit is essentially a diaphragm-operated switch designed for operation on all bulk materials that will flow through a bin. Schematic drawings of control, discharge, level signalling and conveyor feeding control systems are featured.

96. Refractory Specialties

Mullite Refractories Co., 95 Canal St., Shelton 1, Conn. — Ramming mixes, mortars, patches, castables and plastics are among Shamva Mullite refractory specialties described and illustrated in 16-page brochure. Highlights of piece include typical application photos and a 2-page reference chart.

97. Cut-Wire Abrasive Shot

Metals Disintegrating Co., Harrison Abrasive Div., Morris Ave., Elizabeth 13, N. J.—L/D cut-wire abrasive shot available in steel, copper and stainless, applicable to cleaning, peening, tumbling, cutting and abrading is listed with full specifications in data sheet 522.

98. Measuring Instruments

Leeds & Northrup Co., 444 N. 16th St., Philadelphia 40, Pa.—"Technical Data on Speedomax Type G Instruments" are offered in 40-page publication ND46(1). Type G designates family of automatically balanced precision electrical measuring instruments for indicating, recording or controlling electrical, physical and chemical quantities. Wide assortment of accessory devices are covered as well.

99. Core Wash

Delta Oil Products Co., 6263 Cedarburg Rd., Milwaukee 9, Wis.—Instructions for the use and application of Delta Blackoat S-5 wash are given in 4-page folder. Product produces smooth high-refractory waterproof surface on cores over which molten iron flows fast and without interference.

100. Continuous Power Conveyor

Richards-Wilcox Mfg. Co., Materials Handling Div., Aurora, Ill.—Zig-Zag continuous power conveyor, suited to foundry and other industry uses, is detailed in illustrated catalog A-93 of 64 pages. Extensive data on engineering the system and on its accessories are given.

101. Foundry Ovens

Despatch Oven Co., 619 Eighth St., S. E., Minneapolis, Minn.—Various types of foundry ovens with temperature limits from 250 to 1250° F are described and illustrated in 8-page bulletin 40. Drawer and utility ovens, investment casting furnaces, aluminum aging ovens, batch type furnaces, and conveyorized ovens are among units considered.

102. Foundry Equipment

Jeffrey Mfg. Co., 956 N. Fourth St., Columbus 16, O.—66-page illustrated catalog 845 on Jeffrey foundry equipment covers typical handling systems, mold preparation and handling equipment, castings handling equipment and unit machinery for foundry service. Sand reclamation and briquetting systems are diagrammed and explained.

103. Core Binders

United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.—Liquid or dry type Aqua-Set synthetic core binder has its directions for use and its characteristics given in this loose-leaf booklet. Binder is available in several types and its use in dielectric baking is described.

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104. Foundry Facings

Frederick B. Stevens, Inc., Eighteenth & Vernor Highway, Detroit 16, Mich.—Series of 12 single-page technical bulletins cover latest developments in the foundry facings industry. Among subjects are sand conditioners, core and mold surfacer, chill wash, use of plumbago, dry and liquid partings and core paste.

105. Compressors & Pumps

Fuller Co., Catasauqua, Pa.—Single and two-stage rotary compressors with base type and separate intercoolers are subject of 16-page illustrated bulletin C-5A. Many applications are shown. Also detailed are single and two-stage vacuum pumps for dry service. Both have wide capacity range.

106. Jib Cranes

Industrial Equipment Co., 315 N. Ada St., Chicago 7, Ill.—Tabulated capacities, brief description and illustration of jib cranes are presented in 8-page bulletin J-345. Types covered are pillar base mounted; wall bracket; bracket pillar, base mounted; mast type, tension brace; mast type with rods; and mast type with compression brace. Capacities range from 250 to 12,000 lb.

107. Foundry Mechanization

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.—36-page illustrated book 2439 describes and illustrates many types of equipment used in foundry mechanization. Included are dryers, shakeouts, sand revivifiers and conveyors of various types. Planning, typical layouts and case histories are covered.

108. Metallic Abrasives

Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland 8, O.—Twentieth Century line of chilled, Hi-Strength B and normalized cast iron shot and grit, Realsteel shot and drawn steel shot are subject of 16-page illustrated catalog 1153. Specifications and uses of each are given.

109. Automatic Power Scoop

Jeffrey Mfg. Co., 956 N. Fourth St., Columbus 16, O.—How one man can use the Jeffrey automatic power scoop for the safe and rapid unloading of bulk material from box cars is told in 4-page illustrated bulletin 863. Specs and operating data are included.

110. Microscopes & Specimens

Adolph I. Buehler, 2120 Greenwood Ave., Evanston, Ill.—Metallographic test specimens, laboratory cameras and microscopes of various types for use in the metallurgical laboratory are described in an 8-page illustrated bulletin. Prices are given.

111. Muller Type Mixers

Clearfield Machine Co., Clearfield, Pa.—Preparation of foundry sands, how the Clearfield muller type sand mixer works, its applications in sand handling systems and specifications of the various available units are subject matter of illustrated 40-page catalog No. 83.

112. Electric Furnaces

Kuhlman Electric Co., Detroit Electric Furnace Div., Bay City, Mich.—Base-mounted electrode models of Detroit rocking electric furnaces are subject of 4-page illustrated bulletin 505. Nominal cold charges of iron and bronze range from 60 to 700 lb.

113. Air Activated Conveyor

Brady Conveyors Corp., 20 W. Jackson Blvd., Chicago 4, Ill.—The Flo-Veyor system for transporting granulated, lumpy and all dry bulk materials to remote delivery points is described and illustrated in 4-page folder. Material is air activated and fluidized in a closed system.

114. Tractor-Shovel

Tractomotive Corp., Deerfield, Ill.—Applications of the HD-5G Tracto-Shovel in bulk handling operations, a unit offered with a variety of attachments, are shown in detailed 16-page brochure 892-5-53. Construction details and specifications are included.

115. Industrial Washing Machines

Detroit Sheet Metal Works, 1300 Oakman, Detroit 6, Mich.—Photographic examples of extensive line of industrial washing machines made by this company are shown in this 4-page illustrated bulletin.

IMPORTANT READING FOR FOUNDRYMEN

We have a limited quantity of the following reprints which we can furnish while they last.

116. Ford's Cleveland Foundry

By popular request, we are again offering this FOUNDRY reprint "Ford's Cleveland Foundry." It details the plant's coremaking, molding, melting, cleaning and ventilating systems and is superbly illustrated. A list of equipment suppliers is also included in the 56-page reprint.

117. Solving Handling Problems

"Methods and Equipment that Solve Material Handling Problems for the Foundry" is a reprint of seven (7) FOUNDRY articles written by Robert H. Herrmann, associate editor. Articles cover the foundry yard, metal charging, molding department, core room, metal pouring, shakeout and cleaning department.

118. Predicting Casting Costs

Based on statistical analysis of actual parts, this reprint of a *Machine Design* article presents a scientific approach to the accurate determination of casting costs at early design stages. It is written by Philip Tripoli, production design engineering of Northrop Aircraft Co. and contains much information in chart form.

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4-54

(*Continued from page* 232)

with fiber glass fabrics for the production of spotting racks, checking fixtures and assembly jigs. Multiple duplications can be made from original models. Design modifications and repairs are said to be made easily. The company also has developed liquid resins for casting applications and for use in casting stretch dies, acrylic form dies and patterns. Special equipment or facilities are not required for these easy to apply materials.

For More Details Circle No. 13—Page 235

Hoist: Hoist & Crane Division, Robbins & Myers Inc., Springfield 99, O.—Electric wire-rope hoist with

either single or two-speed pushbutton magnetic control has 2-ton rated capacity. Powered by a 2-hp, totally enclosed ball bearing motor, it has an 18-ft lift without overwind. Overwinding allows a 25-ft lift. Upper and lower limit switches prevent overtravel of the hook block in either direction. Magnetic, disk type motor brake opens automatically when the hoist starts and closes instantly when the current is shut off. In addition, a Wesson type load brake has ample area to keep heating within safe limits. Entire gear train is splash lubricated within an oiltight gear case.

For More Details Circle No. 14—Page 235

Stock Cylinders: Miller Motor Co., 2040 North Hawthorne Ave., Melrose Park, Ill.—Company now is offering "stock" cylinders for immediate delivery in several hundred popular combinations of bore, stroke and mounting. They have solid steel heads, caps and mountings; hard chrome-plated piston rods; dirt wiper seals; and leakproof piston and rod seals. They include air and hydraulic cylinders in both cushioned and non-

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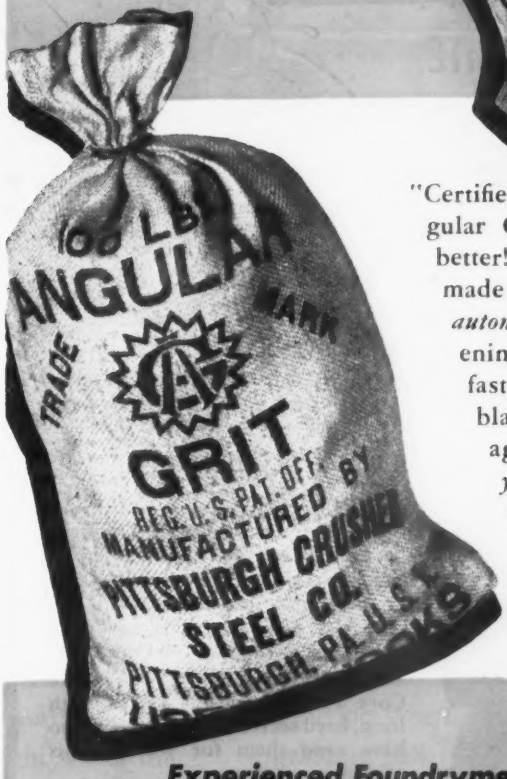

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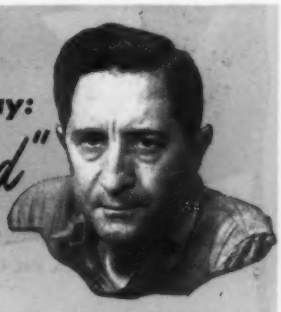

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For More Details Circle No. 15—Page 235

Pulley Lagging Method: Main Products Corp., Dept. 546, 1241 Carpenter St., Philadelphia 47—Neoprene sheet material used in conjunction with a liquid Neoprene bonding agent makes it possible to lag pulleys quickly in place without removing them from their shafts. The corrosion-resistant, cured Neoprene is cold bonded securely to the pulley surface, without rivets, by the bonding agent, which becomes integrated with the sheet and forms a homogeneous mass of Neoprene over the entire pulley surface.

For More Details Circle No. 16—Page 235

Steel Electrode: All-State Welding Alloys Co., 249-55 Ferris Ave., White Plains, N. Y.—Low nitrogen steel electrode reportedly will not freeze to work if held too close to it. An all-position, reverse polarity rod, it is for use on carbon, low-alloy and high-strength steels, on low and medium carbon cast steels and on cold-rolled steel. Physical characteristics of the deposited metal are listed as 75,000 psi tensile, 65,000 psi yield and 27 per cent elongation in 2 in. Electrodes will be available in 50-lb packages in 3/32, ⅛, 3/16 and ¼-in. core diameters.

For More Details Circle No. 17—Page 235

Platen Grinder: Curtis Machine Corp., 1300 East Second St., Jamestown, N. Y.—Horizontal platen grinder made by an affiliate company in Germany is equipped with a serrated rubber contact belt, has both platen and contact roll and is said to cut very fast. Because of the contact belt running between the platen and the abrasive belt, the unit is claimed to provide flat grinding with extremely rapid cutting action. The rubber serrated contact belt also is said to minimize glazing or loading of the abrasive belt because of its high-speed impact action, permitting platen grinding with fine grit coated abrasive belts that maintain fast cutting action and yield fine finishes. The two-speed motor develops belt speeds of 5000 and 12,000 sfpm.

For More Details Circle No. 18—Page 235

Cutting Torch: Arcair Co., P. O. Box 337, Lancaster, O.—Torch for heavy duty work has been added to the manufacturer's line of cutting and gouging torches. Like the others in the line, it is designed to cut and gouge all metals and to use only electric arc and compressed air. The new model features a one-piece insulated head that holds the electrode at a fixed angle to provide better electrode contact and less heat. A spring-loaded plunger holds the electrode in place and also acts as an automatic air valve. The air is on as long as the electrode remains in the torch. These features eliminate all hand grip controls and permit oper-

(*Continued on page* 240)

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You'll find two important reasons why Transite* Core Plates mean faster production: First, core makers can handle more plates with fewer trips. Second, Transite Core Plates are easier to clean . . . core wash, sand, etc., do not adhere to them as readily as to other core plate materials.

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Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

(*Continued from page* 238)

ation of the torch in any direction or position without the need to adjust electrode angle or air controls or to change grip. Two quickly interchangeable heads, for ⅜ and ½-in. electrodes, are supplied with each torch.

For More Details Circle No. 19—Page 235

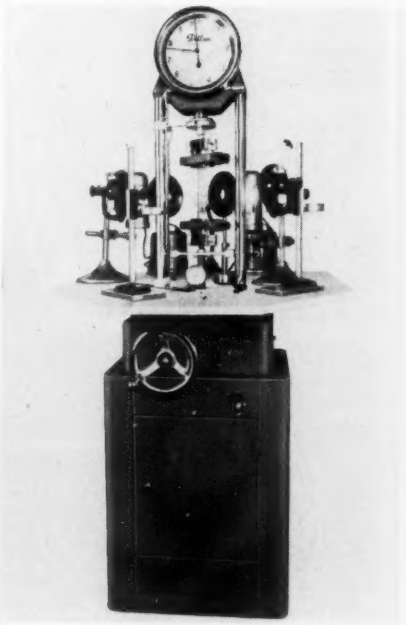
Lift Trucks: Big Joe Mfg. Co., 900-08 West Jackson Blvd., Chicago 7—Working height of 80 in. now is provided for unloading purposes for all of the company's foot operated lift truck models. These units also now offer a new pump which triples the lifting speed of its previous foot-operated models.

For More Details Circle No. 20—Page 235

Electrode Holder: Tweco Products Co., Boston at Mosley, Wichita 1, Kans.—Lightweight 400-amp manual electrode holder weighs 27 oz and is designed to handle electrodes from 3/32 to 5/16 in. Heat from the arc, which is absorbed by castings, is dispelled through air vents between holder castings and insulation on high amperage work. Large-diameter handle has only point contact with the holder casting, permitting a free flow of cooling air. Wedge-shaped upper jaw provides maximum pressure with minimum contact area for a cooler running holder. Laminated glass cloth insulation resists extreme heat and impact.

For More Details Circle No. 21—Page 235

Testing Machine: W. C. Dillon & Co., P. O. Box 3008, 14620 Keswick St., Van Nuys, Calif.—Test arrangement combines polaroid specimens with optical measuring equipment and utilizes the firm's universal testing machine to apply compressive or tensile loads. In the accompanying photo, four polaroid stress computers have been mounted around a tester to ascertain strains from multiple angles. Specimen to be tested is a clear plastic replica machined to the same tolerances as the original. Such plastics reveal internal strains under polarized light and show their inherent weaknesses at critical points, as inside a casting.



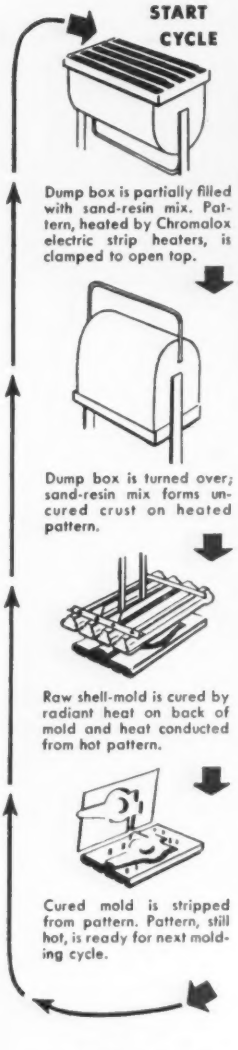
For More Details Circle No. 22—Page 235

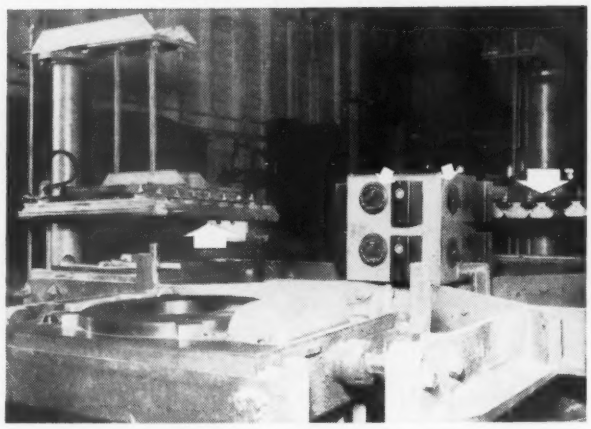
Fork Truck: Baker-Raulang Co., Baker Industrial Truck Division, 1230 West 80th St., Cleveland 2—Low cost, gasoline engine driven, 4000-lb fork truck for outside or rough surface work features travel speed of 14 mph. Large pneumatic tires and high ground clearance make it even more suitable for yard handling operations. An extra heavy drive axle and an oscillating trail axle permit its operation over unimproved or semi-improved surfaces. Standard lifting height is 122 in. Truck is 100½-in. long, excluding forks, and 50 in.,

(*Continued on page* 242)

Another CHROMALOX Production Tip

STREAMLINING SHELL MOLDING WITH ELECTRIC HEAT


START CYCLE
Dump box is partially filled with sand-resin mix. Pattern, heated by Chromalox electric strip heaters, is clamped to open top.
Dump box is turned over; sand-resin mix forms uncured crust on heated pattern.
Raw shell-mold is cured by radiant heat on back of mold and heat conducted from hot pattern.
Cured mold is stripped from pattern. Pattern, still hot, is ready for next molding cycle.



Large arrows show Chromalox all-metal Radiant Heaters used to cure shells. Center arrows point to input controllers which dial heat intensities for various mold sizes and shapes.

PROBLEM

To provide: 1—an intense heat to cure the sand-resin mix speedily; 2—uniform heat for even curing; 3—a compact, easily installed heat source.

SOLUTION

Chromalox electric strip heaters were attached to the pattern bottom to heat the mold from the pattern side. Chromalox radiant heaters with variable input controllers were installed at the curing stations to heat the mold from the other side.

ADVANTAGES

The shell molds are heated quickly and uniformly with heat that's applied evenly over entire area. Both strip and radiant heaters are easily installed. Both are of durable, all-metal construction. Heat is put exactly where it's needed in the precise quantities required.

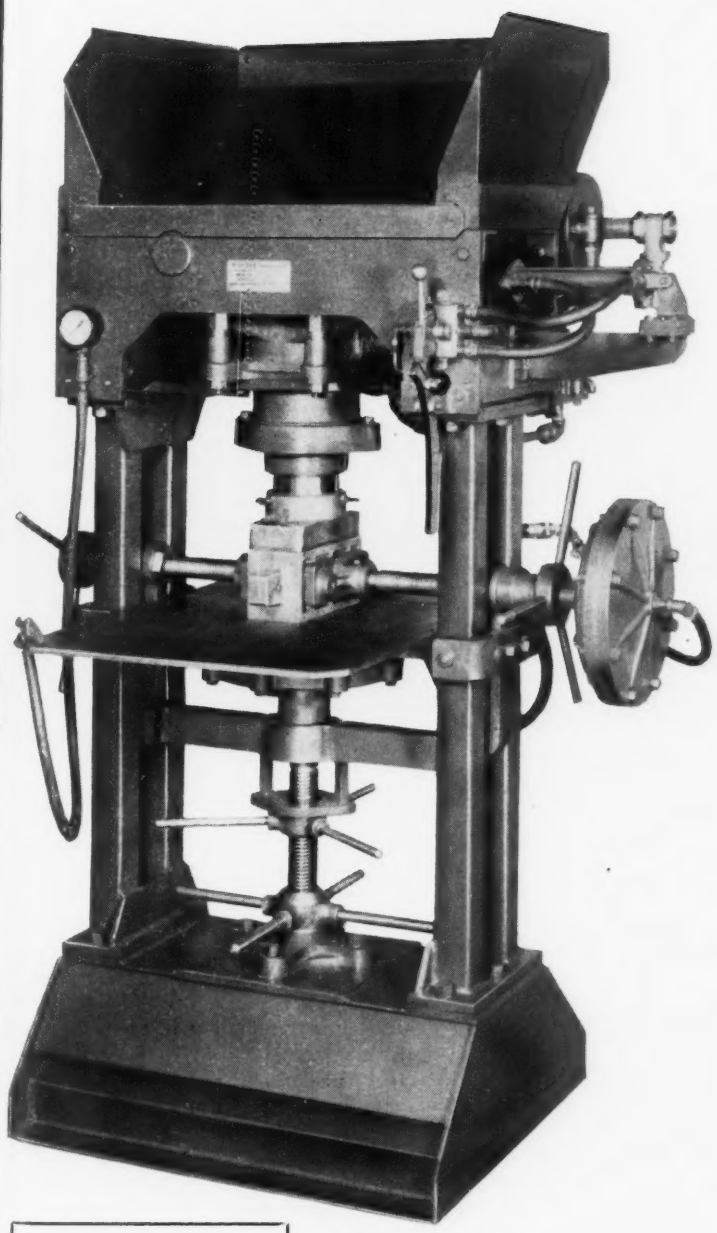
Want to know more about CHROMALOX electric heat?

EDWIN L. WIEGAND COMPANY SB-31
7596 Thomas Blvd., Pittsburgh 8, Pa.
Send me more details on Chromalox Electric Heat for
☐ Shell molding ☐ Core drying
☐ Skin drying of molds ☐ Comfort heating

Name _____
Company _____
Street _____
City _____ Zone _____
State _____

CHROMALOX
Electric Heat for Modern Foundries

Redford NO. 4 CORE BLOWER



Designed to add more power, capacity and speed to traditional Redford simplicity, flexibility and convenience, the No. 4 Redford superbly fills the need for a truly fast and flexible machine to blow cores from a few ounces to 10 lbs.

There is no need for the operator to wait for the machine at any time—the fast operating cycle permits immediate release of the core box after the cores have been blown.

Exhaust air is utilized to thoroughly fluff the sand remaining in the sand magazine after each blow, thus reducing the possibility of cratering.

Magazine heads normally furnished with the No. 2 Redford machine can be used with the No. 4 Redford. Larger new type magazine heads are also available as standard equipment.

A completely new fully adjustable clamp for vertically parted core boxes simplifies core box set up—when not needed the clamp units can be adjusted all the way out or completely taken off the machine.

Redford No. 4 users report production up to 8 boxes per minute using only one core box per machine. To get complete information write for Specification Bulletin 4.

See our exhibit Booth 1506 A.F.S. Convention Cleveland

Cores at right illustrate wide range of work that can be done with the Redford No. 4 Core Blower.

Redford IRON & EQUIPMENT CO.

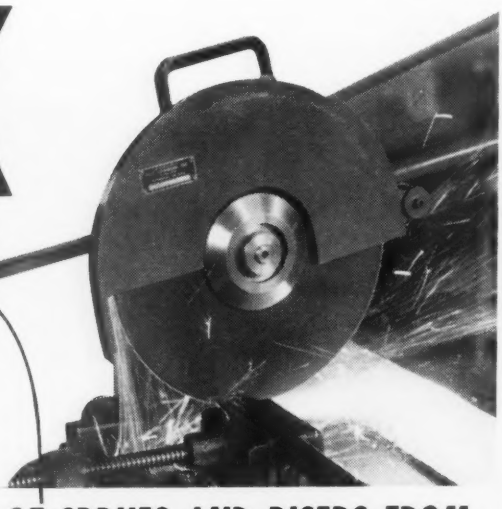
20733 GLENDALE AVENUE • Phone KEnwood 1-8611 • DETROIT 23, MICHIGAN

(*Continued from page* 240)
wide, has 5-in. ground clearance and 92-in. turning clearance.
For More Details Circle No. 23—Page 235

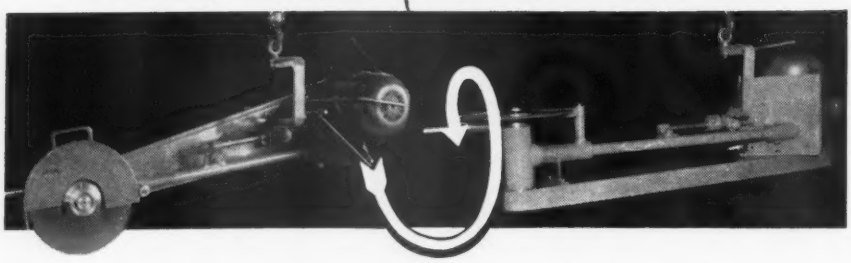
Conveyor Belting: United States Rubber Co., Rockefeller Center, New York 20—Conveyor belts made of rayon are said to be strong, lightweight and resistant to tearing and ripping. They are used in both lengthwise and crosswise directions of belts. Increased flexibility and troughability in the crosswise direction result in less spillage, according to the manufacturer. Reduction in weight by two-thirds means a saving in power required to operate a belt, and the synthetic fabric is said to hold fasteners unusually well. Rayon belts can be repaired with the same techniques used for other belts.
For More Details Circle No. 24—Page 235

Hot Plate: Thermo Electric Mfg. Co., P. O. Box 697, Dubuque, Iowa—Heavy-duty electric hot plate 6 in. high and 9 in. square weighs 15 lb and provides surface temperatures, without load, of 400, 535, 710 and 930° F. Top plate is cast iron; body is stainless steel formed in two sections separated by an insulating plate; and heating element is made of nickel-chromium alloy embedded in a refractory plate of high thermal conductivity which fits into the underside of the top plate. It is made in both 115 and 230-volt, 25/60 cycle, alternating current units. The 230-v units can be operated on 115 v with approximately half the normal temperature.
For More Details Circle No. 25—Page 235

FOX
SWING FRAME CUT-OFF MACHINE



FOR FAST REMOVAL OF SPRUES AND RISERS FROM BRONZE, ALUMINUM AND IRON CASTINGS!



FULL MANEUVERABILITY THROUGH 180°

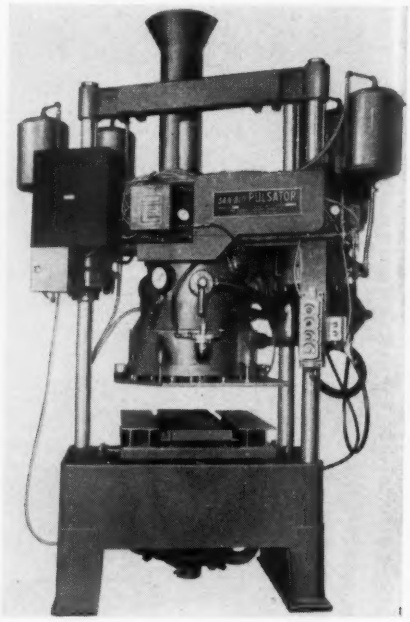
The new Fox Swing Frame Cut-Off Machines have been designed to take advantage of the new type "flexible" cut-off wheels. The machine has full maneuverability through 180°. It is especially recommended for the removal of sprues and risers from bronze, aluminum and iron castings.

Available in two sizes, 16" and 20". Write for Catalog!

FOX GRINDERS, Inc.

OLIVER BUILDING PITTSBURGH 22, PA.

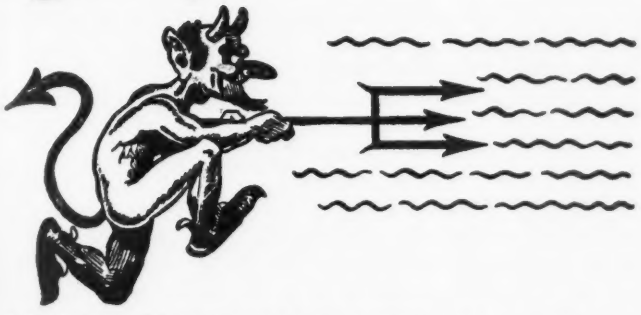
Core Blower Attachment: Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5—Attachment



for the company's core blowers is said to hold corebox wear to such a minimum that corebox maintenance is almost negligible. It prefills corebox with sand at pressures as low as 2 to 10 psi and then switches to full line pressure to pack the sand to correct hardness. A prefill timer and a prefill air valve are provided for adjusting the system to the sand and the box to be blown. The low pressure prefilling assertedly requires little more time than blowing without it. The attachment also is available for the company's pulsating action unit. These models provide a choice of conventional one-blow action for metal coreboxes or pulsating action for wooden coreboxes.
For More Details Circle No. 26—Page 235

Fuel Oil Pump: Eclipse Fuel Engineering Co., Rockford, Ill.—V-belt drive pump is designed to deliver heavy fuel oils at operating pressures up to 100 psi. Meant primarily for use in conjunction with the company's closed flame gas-oil burners, the unit is reported to have high suc-
(*Continued on page* 244)

Soffel's



FLUXES and EXOTHERMIC COMPOUNDS

for all

Metals and Alloys

THERMOTOMIC "X" COMPOUND is an exothermic material which is molded and baked into necked down riser cores and inserts. It produces a temperature of 3500° F. and is used as ring inserts under the risers or feeding heads. Great savings are realized through reduced riser dimensions and cleaning costs. In conjunction with Thermotomic Compounds, Carbon Free Liquidizer No. 5 should be used on top of the metal in the heads.

THERMOTOMIC ABC—For aluminum and magnesium castings, necked down riser cores and inserts—prevents piping and shrinkage into castings. Soffel's ALX-31 Liquidizer should be used on top of the metals in the head.

THERMOTOMIC HoTop LIQUIDIZER — For short risers—saves 60 to 70% of feeding metal in the heads.

EXOTHERMIC CARBON FREE LIQUIDIZER—A feeding head compound for castings and ingots of ferrous and non-ferrous metals — saves metal and prevents piping and shrinkage.

CARBON FREE LIQUIDIZER AL-X31—For aluminum and magnesium feeding heads—prevents piping.

EXOTHERMIC INSULATING SLEEVE CORE COMPOUND—For riser sleeves—adds heat and prolongs fluidity of feeding metal in heads or risers.

DENSILTITE LADLE FLUX—For iron and semi-steel—reduces sulfur and phosphorous. Adds fluidity and temperature in pouring ladles—produces clean iron.

SOFFEL'S NON-FERROUS FLUXES

BB-2—For red brass, nickel and tin bronze pressure castings—removes sulfur, iron, phosphorous oxides and gas from brass and bronze.

SUPER BRASS FLUX—For brass and bronze—prevents oxidation of zinc.

BRASS REFINING FLUX—For cupola melting and open flame furnaces — prevents oxidation. Produces liquid slag and faster melting.

COVERALL BRASS FLUX—Removes gas and oxides from yellow brass and nickel silver.

RADIOCLARITE BRASS FLUX—For open flame furnace melting—increases fluidity, tensile strength, removes gas, oxides and iron.

AB-6 BRASS FLUX—For electric furnace melting of brass and aluminum bronze—keeps furnace linings clean.

KLEEN-ALL BRASS CLEANER—For use in bottom of pouring ladles or open flame furnaces to absorb liquid slag and keep the furnace and ladle linings clean.

BRASS ALUMINUM REMOVER — Removes all traces of aluminum from copper, brass or bronze.

HI-LED BRONZE FLUX—Holds lead up to 50% in copper without use of nickel.

NICKEL MONEL FLUX — Removes gas and adds fluidity to metal.

ALUMINUM BRONZE FLUX—A perfect deoxidizer for reducing aluminum and iron oxide in manganese bronze and aluminum bronze. Adds fluidity.

COPPERTITE FLUX—For high conductivity castings—removes cuprous and cupric oxides and gas from copper.

FERRO-OUT IRON REMOVER—Removes free iron or alloyed iron from brass, bronze or copper.

SOFFELITE ALUMINUM FLUX—Removes aluminum oxide and iron from aluminum and increases the fluidity and tensile strength.

MAGNALUM FLUX—For magnesium and aluminum alloys—removes gas and oxide and increases fluidity.

KLEN ZINC FLUX—A deoxidizer and purifier for zinc base pressure die castings—removes gas, sulfur and iron.

DIE COATING—For pressure zinc base die castings—will not scale, blister or create gas in the molds.

PERMANENT MOLD COATING—For aluminum and magnesium castings — adds longer life to molds. Produces clean gas free castings.

POT COATING—For iron pot melting — increases life of pots. Prevents iron pick up.

U. S. Patents No. 2,490,327 and No. 2,500,097

PITTSBURGH METALS PURIFYING COMPANY

World's Largest Manufacturer of Fluxes and Purifiers For All Metals and Alloys

1352 MARVISTA ST., N. S. PITTSBURGH 12, PA.

(*Continued from page* 242)

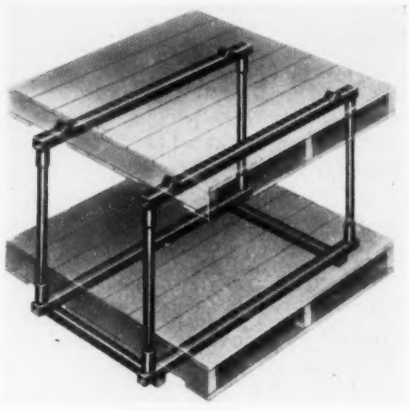
tion and high discharge characteristics that make possible a continuous stream of fuel oil, free of pulsation, to the burner. A gear and crescent type pumping element pumps equally well in either direction at 400 rpm. The V-belt drive is connected to the pump by a loose coupling, thus preventing side pull on the pump shaft. Belt tension is controlled by adjustment of the center distance of the motor.

For More Details Circle No. 27—Page 235

Pilot Burner: Partlow Corp., New Hartford, N. Y.—Pilot for industrial gas burning appliances protects against damage from failure of gas or electric supply. Although it uses no vacuum tubes, it employs the flame conductivity principle to achieve instantaneous cutoff after pilot flame failure. A small electric current which flows across the pilot flame stops when the flame is extinguished. This current operates a relay which controls electrically operated valves in the fuel line. When the pilot is extinguished, the entire fuel supply is cut off instantly.

For More Details Circle No. 28—Page 235

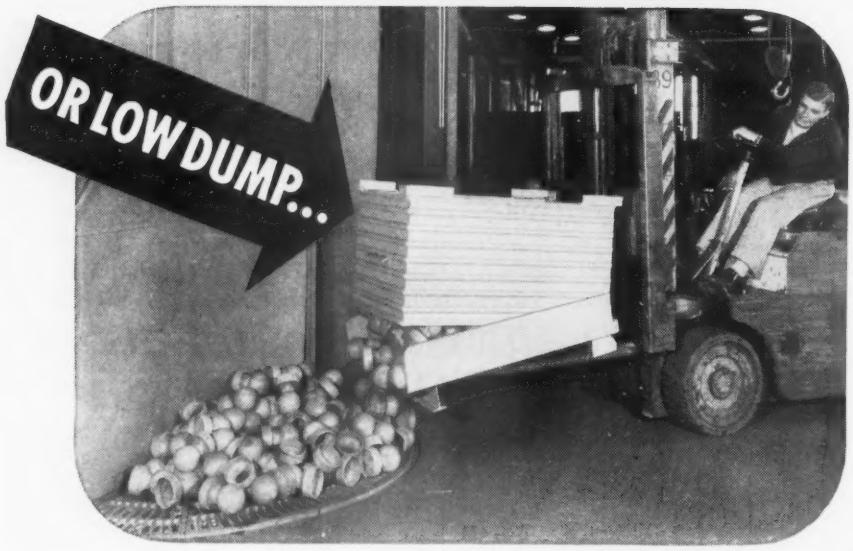
Pallet Rack: Paltier Corp., 1701 Kentucky St., Michigan City, Ind.—Portable pallet rack made with slip-fitting posts is said to increase space utility as much as from 33-1/3 to 50 per cent. Bottom pallet can be set



in or removed from the rack with a fork truck, or the rack and pallet can be picked up and moved as a unit. Unit can be built for a pallet of any size and almost any capacity. Posts also are available in any length desired.

For More Details Circle No. 29—Page 235

Welder: General Electric Co., Schenectady 5, N. Y.—New 400-amp, three-phase, direct current, rectifier type welder with a 60 per cent duty cycle can be equipped to operate on two-phase power and has a current welding range of 70 to 500 amp.



Work-O-Matic* boxes do the job FASTER!

TALK about versatility in materials handling . . . the Work-O-Matic is one of the most efficient and versatile aids you've seen for cutting time and costs!

Used with a hydraulic fork lift truck, a Work-O-Matic box allows automatic, mechanical removal or deposit of parts at any height—*high or low!* And the discharge point remains constant at the selected fork lift height.

You'll also be interested in how these multi-duty boxes, with Union Metal positioning stands, are boosting production up to 50% per man per machine by speeding the flow of material in process at *proper work level!* For *all* the facts, write to The Union Metal Manufacturing Co., Canton 5, Ohio.

*Patent No. 2,445,038. Other patents pending.

UNION METAL
Materials Handling Equipment

Stepless current control facilitates current adjustments. Other features include silicone insulation, instant arc welding, quiet operation, low and easy maintenance and good ventilation. It is operable on 220 or 440 v, reconnectable to either voltage, and is available with full-time arc force control.

For More Details Circle No. 30—Page 235

Weld Chipping Hammer: Atlas Welding Accessories Co., 707 East Lewiston, Detroit 20—Company has

re-engineered its standard model weld cleaning tools. Brush now is pitched at an angle to the handle; the frame which holds the brush and handle is ribbed and made of heavier gage steel; and the chisel is welded to the frame and handle. In addition, the double tension spring that secures the brush in the frame is designed so that pulling it back permits replacement or reversal of the brush. A hand guard has been added at the base of the grip.

For More Details Circle No. 31—Page 235

Induction Motors: Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10—Line of squirrel-cage induction motors, including protected and enclosed motors for all industrial purposes, is being built to recently adopted standards of the National Electrical Manufacturing Association. They feature greater horsepower in less space than before and better protection of motor windings, leads and bearings. First to appear will be built for 1, 1½ and 2-hp applications in frame sizes 182 and 184. Balance of the line, up to and including 30 hp, will be introduced at regular intervals during 1954 and early 1955.

For More Details Circle No. 32—Page 235

Crane Weight Indicators: Martin-Decker Corp., Long Beach, Calif.—Small, low cost crane weight indicator can be attached to boom cranes, bridge cranes or overhead hoists with capacities up to 50,000 lb. It consists of a small hydraulic pressure transformer installed at the dead end of the hoisting cable and a high pressure hydraulic hose to transmit the weight to an indicating gage with a 6-in. direct reading dial. The gage is mounted at the operator's position for convenient tare adjustment and accurate readability. Guaranteed accurate to 1 per cent of the maximum reading on the dial, the unit is available in 10,000, 25,000 and 50,000-lb capacities.

For More Details Circle No. 33—Page 235

Flexible Couplings: Link-Belt Co., 307 North Michigan Ave., Chicago 1—Geared flexible couplings for high-speed and high-torque applications are available in ten standard sizes, with bores ranging from 1 to 6 in. and with horsepower ratings at 100 rpm ranging from 2 to 450. Hubs bored for either slip or shrink fit on shaft can be furnished. The two-section, free floating housing has internally cut gear teeth. Sections are rabbet fitted and bolted together to function as a single, rigid unit. Wide face of the internal gear provides for end float of connecting shafts while maintaining full-tooth contact; externally cut gear teeth of the hubs are machined to provide constant clearance

CAN YOU AFFORD to make sand strainer cores in your plant?

We Invite You To MAKE THIS TEST

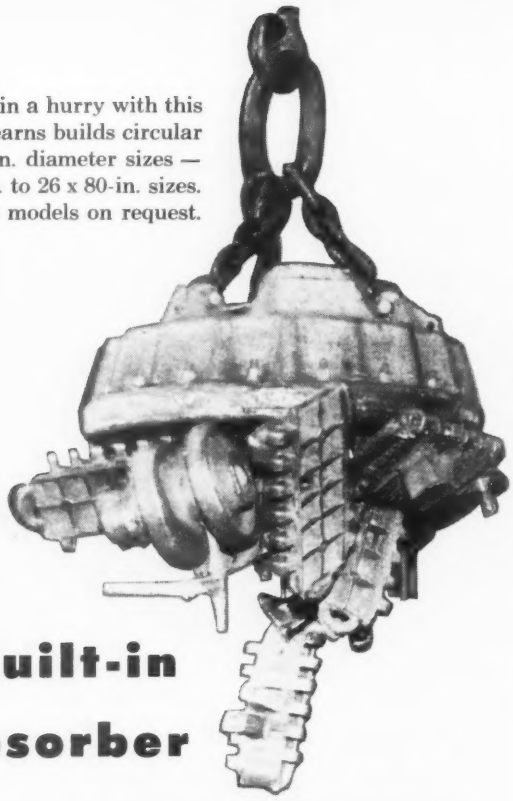
• Can ceramic strainer cores give you better castings at lower costs than sand strainer cores made in your own plant? Investigate! Make this test—free!

Just tell us the sizes and quantities of sand strainer cores you are now using, or send us samples of your sand cores. In turn we will send you samples from our large stock of standard size ceramic cores for this test. Don't miss this chance to compare. Write today.

Porcelain Products' Ceramic Strainer Cores are available in a wide range of standard sizes—or, on special order, in sizes to meet your specifications.

60 years Porcelain Products, Inc. PP INC. FINDLAY, OHIO

Bulky castings are moved in a hurry with this lifting magnet. Stearns builds circular models in 20 to 65-in. diameter sizes — rectangular in 9 x 24-in. to 26 x 80-in. sizes. Custom-built models on request.



Exclusive Built-in Shock Absorber

PROTECTS DEEP-DOWN PULLING POWER

Heavy bronze coil cover provides cushion against shocks and jars.

Powerful, deep-field Stearns lifting magnets are built with an extra wall of protection against shocks and jars. In addition to the regular coil shield of chrome-nickel steel, Stearns adds a heavy bronze coil cover — an *exclusive* feature.

This shock-absorbing cover provides a double advantage — it is both ductile and tough. It not only absorbs jolting impacts when the magnet is banged against sharp, hard objects — it is strongly resistant to damage.

Find out *all* the ways Stearns protects deep-down pulling power — gives you long life, profitable lifting magnet operation. See your Stearns representative or write for your copy of Bulletin 35-B-1. 1075

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

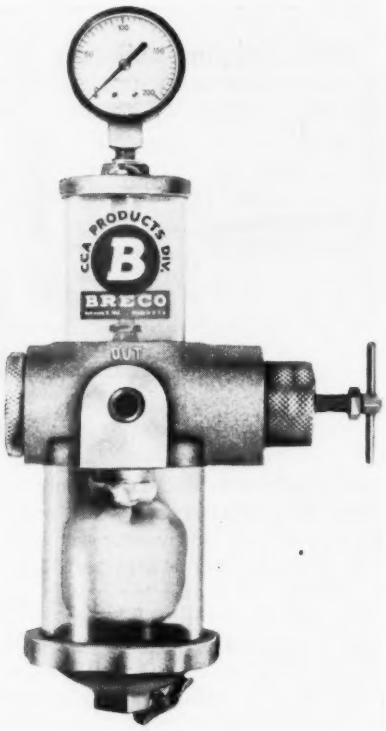
STEARNS MAGNETS

STEARNS MAGNETIC, INC. 662 S. 28 St., Milwaukee 46, Wis.

at the root of the internal teeth of the housing and thus can accommodate reasonable misalignment, according to the manufacturer.

For More Details Circle No. 34—Page 235

Air Line Attachment: CCA Products Division, Breco Mfg. Co. 309 East Saratoga St., Baltimore 2—Combination filter, regulator and lubricator for compressed air lines simplifies piping because it requires only two connections for attachment to any air line. Transparent bowl shows when the filter is dirty, and the filter element can be changed quickly. Oil reservoir can be filled without shutting down the air line. Nondiaphragm, piston type design provides close control for air operated equipment requiring 0 to 100 psi in 2-lb increments and 0 to 200 psi in 5-lb increments. It bleeds downstream lines to any pressure required between line pressure and atmosphere and automatically bleeds downstream line to atmosphere at shutoff. Unit is available for pipe sizes from ¼ to ¾ in.



For More Details Circle No. 35—Page 235

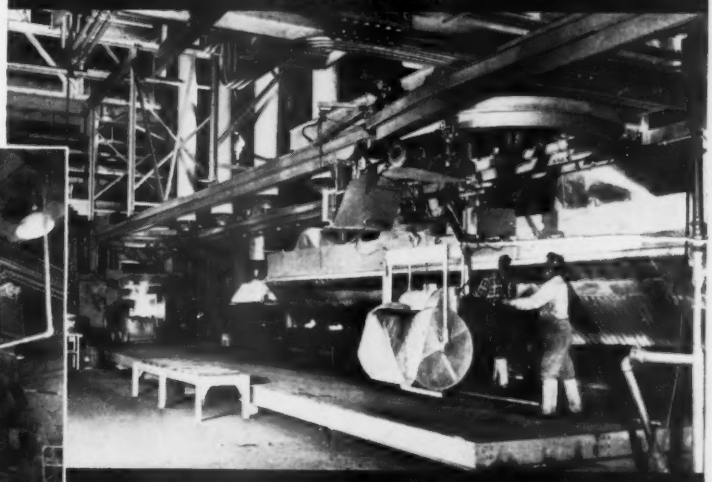
Discharge Valve: Stop-Fire Inc., 125 Ashland Place, Brooklyn 1, N. Y. —Discharge valve is said to eliminate possibility of valve failure in a dry chemical fire extinguisher. Spherical design of the valve is said to assure accurate, secure valve seating and to end fouling and other interference with the valve operation. In addition, the extinguisher equipped with the device assertedly will continue to hold its operating pressure even though it repeatedly is discharged

(*Continued on page* 248)

USE-
MONORAIL
for
Modern Foundry Handling

Free moving cranes cover large pouring floor

Hand pushed cranes serve mold preparation from conveyor loop



Continuous pouring with MonoTractor® Carriers

It meets all requirements for space limitation. Uses overhead space under congested areas.

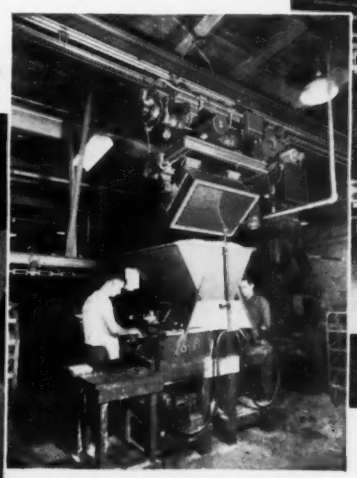
Versatile application. Hand or power operated carriers . . . many automatic features available.

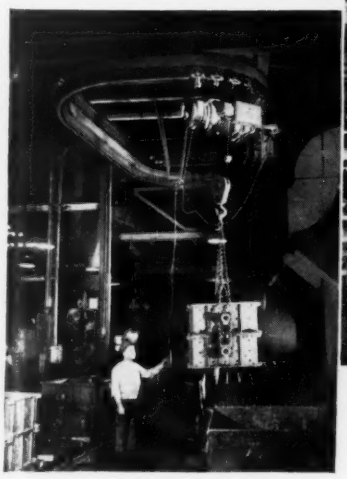
MonoRail is permanent, inexpensive and has extremely low maintenance costs.

SEND FOR BULLETIN C-1

or we'll be glad to have our representative call on you.

Automatic dispatch delivery of fresh core sand





MonoTractor carrier serves shakeout from MonoRail loop

AMERICAN OVERHEAD HANDLING EQUIPMENT

MONORAIL COMPANY

13104 ATHENS AVENUE • CLEVELAND 7, OHIO

(*Continued from page* 246)

partially. The extinguisher is charged with a highly fluid, noncaking dry chemical extinguishing powder and pressurized at 150 and 200 psi with dry nitrogen. It currently is available in 3, 4, 5, 10 and 20-lb capacities.

For More Details Circle No. 36—Page 235

Safety Spectacles: Watchemoket Optical Co., 232 West Exchange St., Providence, R. I.—Shatterproof, multipurpose safety spectacles weigh

hardly more than an ounce. Protection over the eyes from glare and flying particles is provided by a built-in visor, an extension of the frame shaped to fit snugly against the wearer's forehead. Injury from side or bottom is claimed to be prevented by semicup lenses, flanges of which extend from the lenses toward the cheek. Single frame style is said to fit all workers because of a "universal" nosepiece and adjustable temples. Optically correct methacrylate lenses can be removed or inserted quickly.

For More Details Circle No. 37—Page 235

Woodworking Machine: DeWalt Inc., Lancaster, Pa.—Automatic safety lock has been added to the carriage on which the cutting head of the company's radial arm type woodworking machine rides. The lock acts as a brake on the gliding action of the ball bearing carriage. The operator depresses the plunger with his thumb to allow the carriage to roll freely forward and back on its machined tracks, and a positive lock goes into action instantaneously when the pressure from his thumb is released. The entire locking mechanism can be instantly disengaged when the machine is being used.

For More Details Circle No. 38—Page 235

Leather Preservative: Dow Corning Corp., Midland, Mich.—Silicone leather preservative is claimed to keep work shoes and leather equip-

STANDARD HAS ENGINEERED AND BUILT FOUNDRY CONVEYORS SINCE 1906

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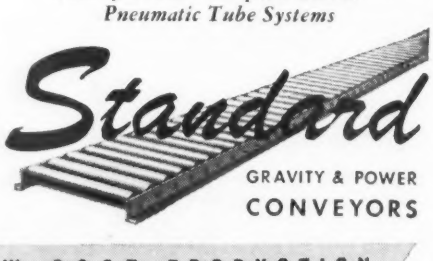

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ment soft and pliable despite the deteriorating influences unavoidable in many industrial plants. A clear liquid, it is applied with a soft cloth or a swab. Instead of sealing pores, it coats individual fibers, permitting treated leather to "breathe." Air is let in, but water, oil and various chemicals are kept out. It also is said to increase resistance to flex abrasion and heat by as much as 50 per cent.

For More Details Circle No. 39—Page 235

Ball Bearing Units: Sealmaster Division, Stephens-Adamson Mfg. Co., Aurora, Ill.—Ball bearing units in rubber mountings with pressed steel housings are manufactured in six shaft sizes ranging from ½ to 1 in. and are available as pillow blocks, flange units and cartridge units. Designed for reduction of noise and vibration, they are particularly adaptable for use on air conditioning equipment and other light duty applications. Synthetic rubber mounting rings are oil and grease resistant, and the bearings are lubricated for life at the factory. Hardening process used on the inner race ring heat treats through the ball path section only. The bearing units are grounded to the steel housings to prevent buildup of static charge.

For More Details Circle No. 40—Page 235

Sand Conditioner: The Moulder's Friend, Dallas City, Ill.—Sand conditioner conditions 5 tons of sand

and carries it to a stationary molding machine in 10 minutes, according to the manufacturer. Flat, tempered-steel wires of the rotating brush condition the sand as the machine travels from the gangway to the rear of the heap. At the rear, the machine reverses direction, and the brush once again conditions the sand and throws 1200 lb into the bucket attachment. When the bucket has been filled, it is raised, and the unit carries the sand to any specified point, drops it for future use

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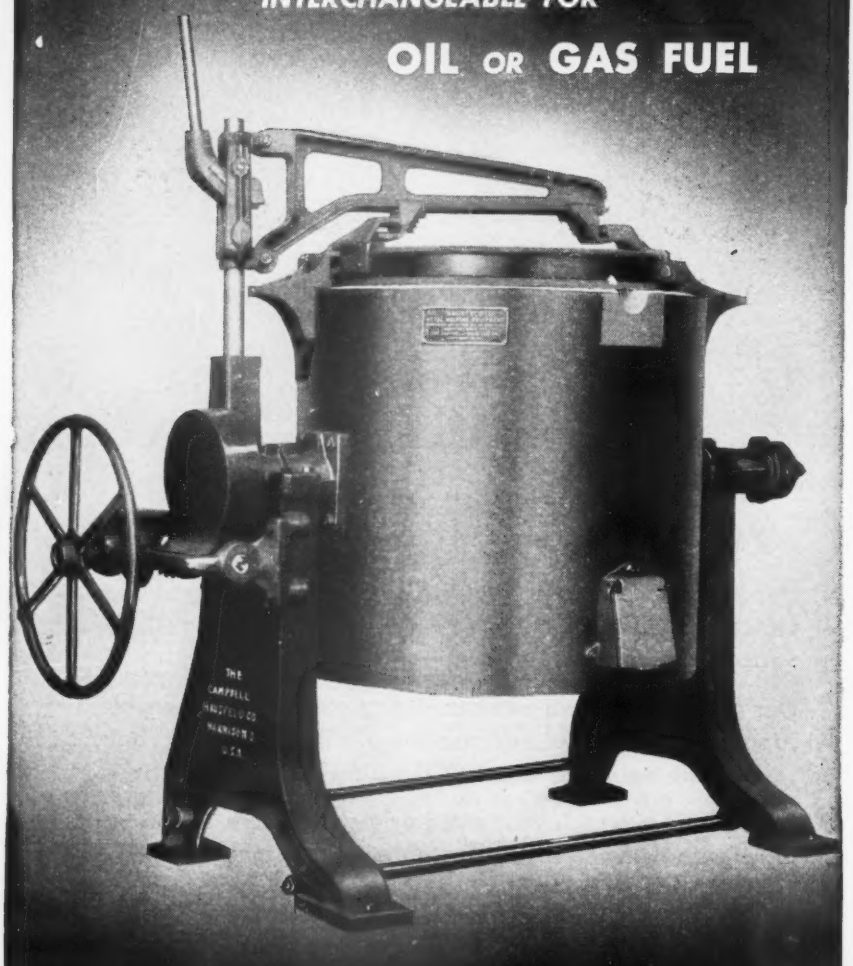

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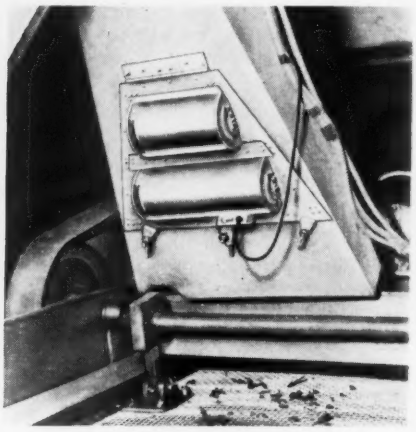
300-320 MOORE ST. HARRISON, OHIO

and returns to the heap to repeat the operation. When not piling sand, the machine has a capacity of 2 tons per minute.

For More Details Circle No. 41—Page 235

Magnet Alarm System: Erie Mfg. Co., Dept. MB-2, Erie, Pa.—Automatic alarm system for magnetic separators is reported almost to eliminate possibility of human error. A sensitive ferrometer constantly measures the quantity of tramp iron as it accumulates on a magnet's surface and reacts on a circuit to trip the alarm as soon as a predetermined accumulation has been reached. Location and type of alarm are optional.



Current required to operate the warning system does not affect the magnet field of the separator.

For More Details Circle No. 42—Page 235

Fan Ventilator: Swartwout Co., 18511 Euclid Ave., Cleveland—Centrifugal fan ventilator is reported to have been completely redesigned and improved mechanically. New one-section hood, which lifts on swing hinges in smaller models and is removable in large sizes, covers motor chamber and directs air exhaust downward for dispersion over roof. Removal of hood provides easy access to motor and fan chambers for servicing and cleaning. Designed primarily for low noise level duct exhaust, the fan is cataloged in 14 sizes and in a wide range of capacities at static pressures from 0 to ⅞ in.

For More Details Circle No. 43—Page 235

Polishing Desk: Buehler Ltd., 2120 Greenwood Ave., Evanston, Ill.—Cabinet type metal specimen polishing table with companion storage cabinets has Formica top, two 12-in. swing spouts and an 8-in.-diam wash bowl with drain, plumbing and wiring. Unit is 27 in. deep, 30 in. high to table top and 60 in. long. Covers are held in place on the back by magnetic holders. Construction is all metal.

For More Details Circle No. 44—Page 235

Wisconsin Conference

(*Continued from page* 154)

for the sand, and its velocity and not pressure is the important factor. Vents in coreboxes preferably should be in the cope since they tend to plug when placed in the bottom. Universal blowplates with movable holes will serve a variety of open boxes. Mr. Redin mentioned that difficulty with excessive moisture in sand often is due to water in the compressed air line.

Concluding session on gray iron dealt with gating with Carl B. Stone, Lynchburg Foundry Co., Lynchburg, Va., as speaker. L. J. Woehlke, Spring City Foundry Division, Waukesha, Wis., and E. Zick, J. E. Gilson Co., Port Washington, Wis., were chairmen. Mr. Stone said that experimental and practical applications involving a taper down sprue with the choke at the bottom, and an enlarged basin with a diameter equal to twice the runner width at the bottom of the sprue gave good results. Runner should be stepped down to maintain velocity of the metal stream at distant gates.

If the metal stream flows at the rate of 12 in. per second for a distance of 6 in. in the runner, it will free itself from inclusions. Standard pouring times vary with different section thickness as follows: For ¼-in. T (sec) equals 0.25/W; for ⅜ to ¾-in. sections T equals 1.8/W; for 1 to 1½-in. sections T equals 2.2/W, and for 2 to 4-in. sections up to 200 lb T equals 3.0/W. Mr. Stone also advocated taking the ingates from the bottom of the runner, and that the ingate area should be twice that of the choke.

Malleable Sessions—Opening malleable iron session pertained to work simplification, with N. N. Amhrein, Federal Malleable Co., Milwaukee, and D. Feather, Appleton Electric Co., Milwaukee, presiding. James H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Mich., was the speaker. After showing the motion picture film "Methods and Opportunities in the Foundry" which illustrated the subject, he enlarged on the possibilities of reducing operator fatigue and work simplification through good housekeeping. Placement of inexpensive tables and racks to hold tools was suggested for jobbing foundries. Mr. Smith defined methods engineering as an analysis of the advisability of combining operations or arranging their sequence for easier performance.

W. D. McMillan, McCormick Works, International Harvester Co., Chicago, directed his attention to favorable

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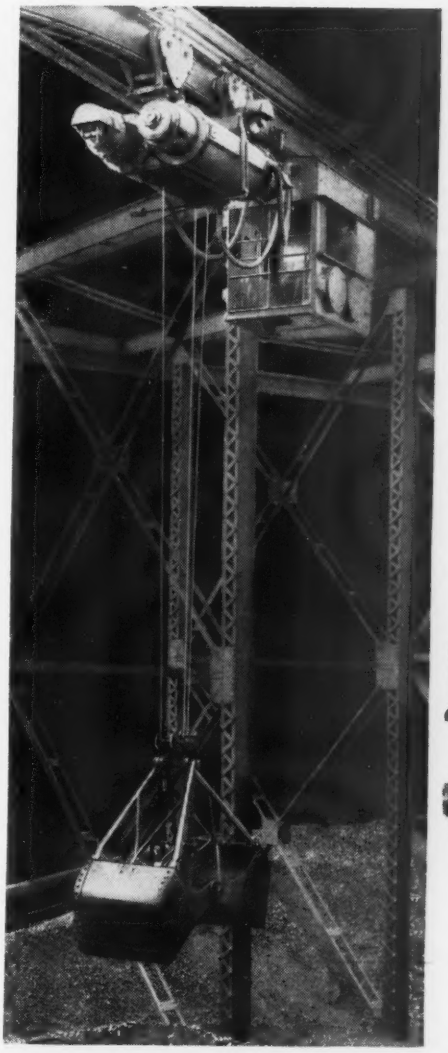

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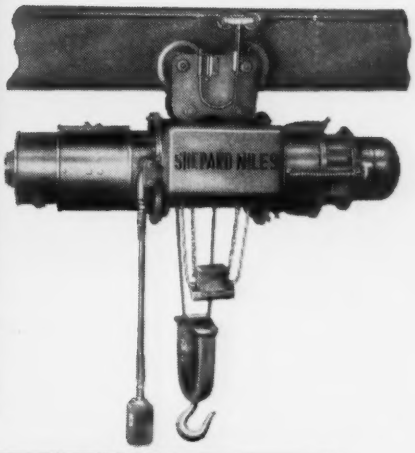

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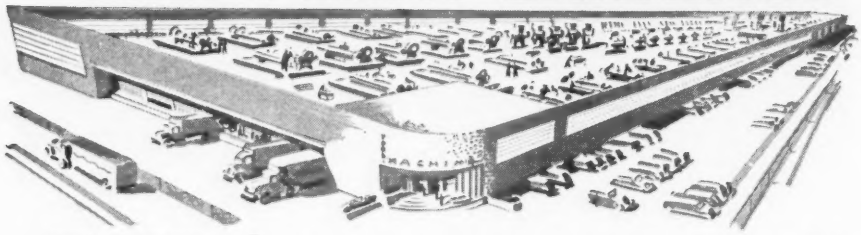

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and unfavorable surface conditions of malleable castings. Stephen Pohl, Federal Malleable Co., West Allis, Wis., presided, and D. E. Feather, Appleton Electric Co., South Milwaukee, Wis., was co-chairman. The paper presented a discussion of the importance of three types of rims frequently encountered, namely, graphitic, pearlitic and ferritic—all to be avoided.

Surface of a casting is important, Mr. McMillan asserted, because it is the as-cast surface that is the most highly stressed in service. He discussed the effect of surface areas on physical properties, how the various rims are produced and how the unfavorable types may be avoided. Rims are not always due to conditions of anneal, he said, composition and melting practice often being responsible for certain types.

Effects of Melting Atmospheres

Richard W. Heine, University of Wisconsin, talked on melting atmosphere effects on metal properties at the third malleable session. M. A. Harder, Lakeside Malleable Castings Co., Racine, Wis., and N. N. Amhrein, Federal Malleable Co., presided. Prof. Heine stated that atmosphere effect falls into direct and indirect classifications. The former is accompanied by a change in physical properties not related to Si, P, C, etc. content, while an indirect change is one which causes the base analysis of the iron to be different from what normally would be expected.

Work with atmospheres ranging from 100 per cent N to 21 per cent O and 79 per cent N showed that a reducing atmosphere reduced SiO_2, MnO and FeO. Oxidizing atmosphere resulted only at a loss in C at temperatures above 2635° C. Dry combustion gas oxidized C and had no effect on Si and Mn while wet gas oxidized C, and Si and Mn during melt-down only. Free O gave same results as the wet atmosphere, but to a greater extent. During the combustion gas atmosphere tests a continuous analysis of incoming and outgoing atmospheres showed no difference until the temperature reached 2635 to 2695° F where the atmosphere and iron began reacting and caused an abrupt change in outgoing gases with CO_2 increasing and CO decreasing.

In discussing foundry refractories at the concluding session of the malleable group, R. A. Witschey, A. P. Green Fire Brick Co., Chicago, showed a 40-minute colored sound movie "Refractories—Master of Fire—Servant of Industry," which described manufacturing operations at his company's plant. Presiding was D. E. Feather, Appleton Electric Co., South Milwau-

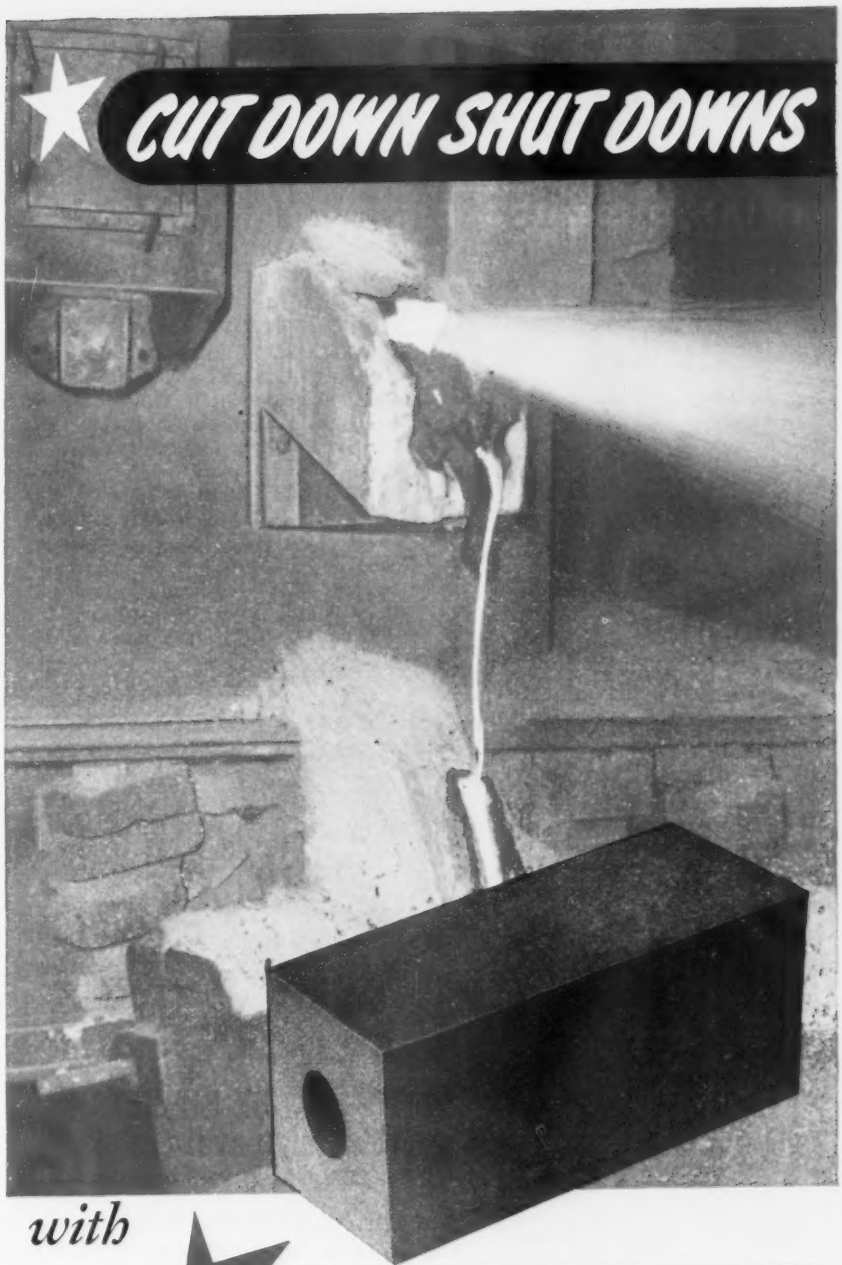
kee, Wis., with Stephen Pohl, Federal Malleable Co., West Allis, Wis., as co-chairman. Mr. Witschey amplified the movie with slides covering applications of refractories to the foundry, with particular reference to monolithic types and pointing out certain types of mortars as indicated by their resistance to attack by air furnace slag. He also covered applications of plastic refractories in ladles and mixers and small high-speed reverberatory furnaces. Discussed too were use of both plastic and castable refractories in electric arc furnace roofs.

Nonferrous Sessions—In introducing his discussion of light metal foundry practice Hiram Brown, Solar Aircraft Co., Des Moines, Iowa, stated that every foundry should have a laboratory, even if small, and a metallurgist to help evaluate shop practices and to suggest techniques to improve quality or reduce scrap. K. L. Jacobs, Standard Brass Foundry Co., Milwaukee, and E. W. Jagmin, Ampco Metal Inc., Milwaukee, presided. Mr. Brown described various furnaces used for melting aluminum and magnesium alloys as well as pots and crucibles, furnace charging, and melting. Due to differences in practices in the latter he discussed the procedures for aluminum and magnesium separately.

Excessive temperature in melting aluminum causes gassy and coarse-grained metal. Cover fluxes usually are mixtures of sodium or potassium chlorides and fluorides. With Mg containing alloys the flux contains magnesium chloride. Degassing aids in removing suspended nonmetallic particles from the bath. With magnesium, cover fluxes must be used to prevent oxidation. Such fluxes contain fluorides and chlorides. Chlorine gas fluxing degasses and removes inclusions at the same time.

High-pressure molding for nonferrous castings was discussed at the second nonferrous session by T. E. Barlow, Eastern Clay Products Department of International Minerals & Chemical Corp., Chicago. Henry Seeboth, Thomas H. Gregg Co., Milwaukee, was chairman, and Lloyd Quirk, Carpenter Bros. Inc., Milwaukee, was co-chairman. Mr. Barlow's discussion appears on page 111 of this issue.

To compete with other foundries and with other methods for producing metal parts, the brass and bronze shop of limited means for capital investment must not hesitate to adopt labor-saving equipment and improved methods of established merit according to H. M. St. John, Crane Co., Chicago. Carl Van Buren, Milward Alloys Inc., Milwaukee, and Otto Sadofsky, Kenosha Brass & Aluminum Foundry Co., Racine, Wis., presided.



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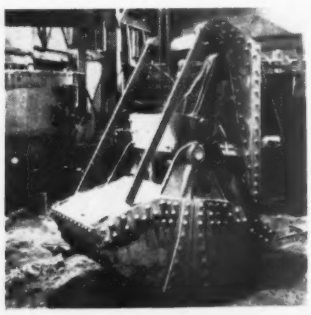
Right—This open head type Blaw-Knox Bucket, rated 1-cu. yd., is equipped with liner plates for rehandling sand, coal, limestone, etc. Shown reeved 2-parts for 8'9" headroom. Choice of sizes.



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On the other hand, the speaker said, such a foundry needs to avoid spending for things which do not fit its needs or are likely to become obsolete quickly. Considered worthy by Mr. St. John and not too expensive are pyrometric control of pouring temperature, control of molding sand properties and materials handling tailored to fit the individual need. Shell molding and dielectric core baking he also cited as advanced practices, meriting study.

Concluding session of the nonferrous group was a bit unique in that the speakers headlined at the three preceding nonferrous sessions were assembled to constitute an "information" panel. These were Hiram Brown, Solar Aircraft Co., Des Moines; H. M. St. John, Crane Co., Chicago; and T. E. Barlow, Eastern Clay Products Department of International Minerals & Chemical Corp., Chicago. Walter W. Edens, Allis-Chalmers Mfg. Co., West Allis, Wis., was moderator. Otto Sadofsky, Kenosha Brass & Aluminum Foundry Co., Racine, Wis., and Lloyd Quirk, Carpenter Bros. Inc., Milwaukee, were chairman and co-chairman, respectively. Among the subjects discussed with generous audience participation were: Melting practice; heat treating of bronze used in casting valve bodies; gating and gating systems; effect of humidity in pouring brass castings; and use of synthetic sands in brass founding.

Pattern Sessions—The first session on patterns considered a paper, "Casting and Related Pattern Design," by William Bender, General Electric Co., Erie, Pa. Walter Kollmorgen, Kollmorgen Pattern Works, Milwaukee, was chairman and M. C. Frankard, Delta Mfg. Co., Milwaukee, co-chairman. Mr. Bender pointed out that competitive casting pricing has required better manufacturing methods in the foundry industry. To provide castings buyers with higher quality castings at lower costs, planned engineering of casting and pattern designs is necessary.

Manufacturing engineers no longer feel that a foundry suggestion of a design change is a reflection on ability and good judgment. Patternmakers also are encouraged to make suggestions on functional improvements on patterns. Mr. Bender stressed the fact that each different design is a problem of its own in the method of producing the casting as well as the kind of related pattern equipment required.

With H. Arneson, Spring City Pattern Works Inc., Waukesha, Wis., and W. T. Schmidt, Giddings & Lewis, Fon du Lac, Wis., presiding, those attending the second pattern session heard an interesting talk by George Dreher, Waukesha Foundry Co., Waukesha. He stressed the point that the

pattern industry should keep in closer contact with design and foundry engineers in order to keep up with increasing complexities of modern castings. Rapid change in design practices of industry was given as an added reason. Other considerations necessary included identification of pattern alloys, type of molding equipment on which the patterns are to be used, and reference points used in pattern layout.

Mr. Dreher added that many castings are scrapped because the designer, patternmaker and inspector used different reference points for layout. Application of toolroom equipment in pattern shops was cited as a means of meeting the needs of foundries.

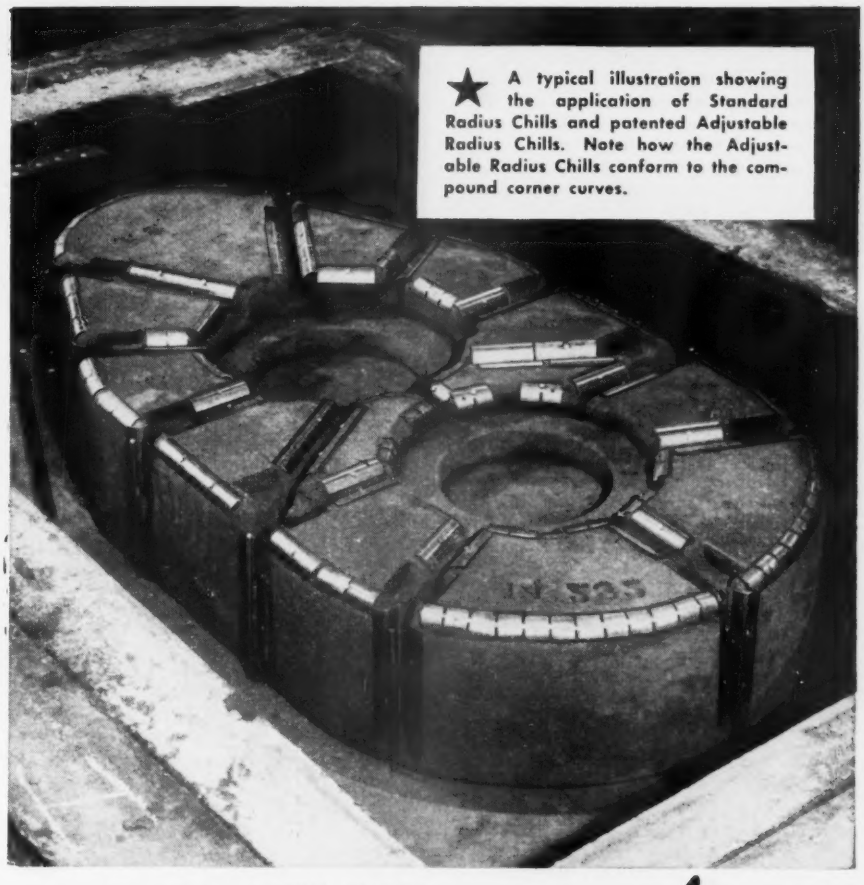
Walter Siebert, Cleveland Standard Pattern Works, Cleveland, presented his ideas on best procedure for constructing large and complicated wood patterns. Presiding was M. C. Ehrman Jr., International Harvester Co., Milwaukee, and H. W. Stokes, Waukesha Foundry Co., Waukesha, Wis. was co-chairman. In particular, Mr. Siebert stressed the need for co-operation between the designer and patternmaker.

Make Careful Study

Steps to follow upon receipt of an order for a big pattern are as follows: Study the print, confer with the customer to ascertain exactly what he wants and which are critical surfaces, confer with the foundry to determine the best way to mold, and finally find out the number of castings required. The easiest way to construct the pattern is not always the best way, he admonished. He also emphasized that the customer is not interested in the pattern as such; it is the castings he wants.

Pattern sessions ended with a talk on patterns for shell molding by Ray Olson, Shell Process Inc., Chicopee, Mass. H. W. Stokes, Waukesha Foundry Co., presided. According to Mr. Olson aluminum, copper-base and cast iron can be used, but for long production, the latter is preferred. Copper-base alloy tends to nick or mar. Patterns made of aluminum by the cast matchplate process must be checked carefully to see that proper joints are secured on the shells.

Same materials should be used for patterns and plates since they are heated and differences in thermal expansion may result in shifts in the shells. To provide uniform heat transfer from pattern to resin-sand mix, the patterns and plate preferably should be of the same thickness—lightening the patterns instead of making them solid. In finishing the patterns care must be taken to eliminate any backdraft, and any strokes



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with emery paper or tools should be in the vertical direction to prevent sand stickdowns. Where adhesive materials are used to fasten the shell molds together, at least ¾-in. space should be allowed between cavities and gating system to prevent any possible flow of the adhesive into the cavities.

Connecticut Foundry Will Mark 100th Anniversary

Oct. 2, 1954, will mark the 100th anniversary of Malleable Iron Fittings Co., Branford, Conn. Founded as the Totoket Co., after the original name of Branford, for the manufacture of wrought, cast and malleable iron, it was taken over ten years later by a group of New England merchants who wished to develop the malleable potential and incorporated the organization under its present name. Since 1906, however, it also has produced steel castings.

The company still is owned, headed and managed by the descendants of the families which founded it, with members of the third and fourth generations active in the firm. Among the employees of the company, some families have served for three generations. The late Lester J. Nichols, who was secretary, served for 80 years.

MIF plans a number of features during its centennial year, including publication of a brochure on its history entitled "Fitting Reflections."

Book Review

Materials and Processes, by James F. Young, cloth, 1074 pages, 5¾ x 9 in. Published by John Wiley & Sons, New York. Price $8.50.

This second edition of a well known work on materials and processes for students and practicing engineers dealing with product development, design, production, processing, quality, and application almost has been rewritten to bring it up to date, and new chapters have been added.

New chapters cover metallographic examination; structure and properties of nonmetallic materials; rubber; ceramics; porcelain and glass; miscellaneous nonmetallic materials, and statistical methods useful in quality control. Sections have been added on tarnishing, electrical contacts and nondestructive testing, and the coverage of many subjects has been expanded and includes bearing metals, special alloys, nonferrous elements, blow molding of thermoplastics, shell molding and pressure welding.

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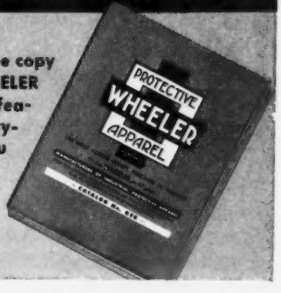


High Pressure Molding

(*Continued from page* 111)

proper pattern design reduces the necessity for extreme pressures.

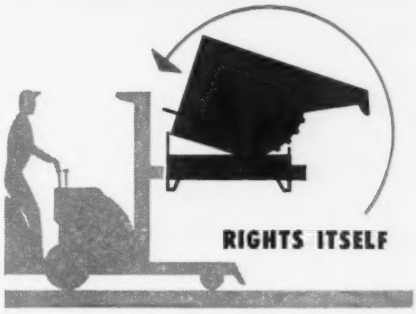
Bearing Surface—Another important aspect of the same design problem is bearing surface. Because we are dealing with green sand rather than a rigid surface, the process should permit complete control of the dimension across the parting line. There should be no fins or flashings at the parting because the two sand surfaces can be "crushed" slightly to pinch off any fins at that point. After all, the molds, though at maximum hardness, still have some deformation. However, this can be true only if the pattern and flask are designed to permit adequate sand-to-sand contact to control the dimension.

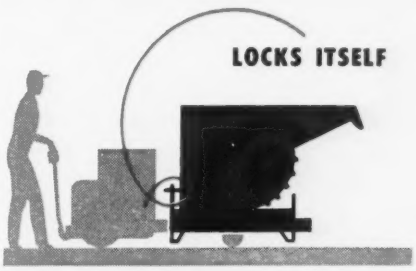
With sufficient sand-to-sand contact (or bearing surface), slight imperfections of the flask from warpage or abuse can be ignored because the sand line controls the dimension. On the other hand, if the bearing is insufficient, the flask line will control the parting line and variations will occur as soon as imperfections develop in the flask faces through warpage and abuse.

Aside from the placement of patterns in the flask, there are other obvious requirements in flasks for precision molding in green sand. The load applied by even 100 psi molding pressure can be rather startling. For example, a simple 20 x 30-in. flask, squeezed at 100 psi may be subjected to a total load or squeeze of from 30 to 40 tons. (The variation will be explained later.) This load requires flasks which incorporate design rigidity. They may be lighter than many of today's flasks if they utilize rigid engineering shapes such as I, or H or channel sections. In many cases, the upper and lower flanges of the flask should be wider to accentuate the channel or H shape now used.

Pins Must Be Accurate—The flask pin device must be accurate and reliable. In general, this requires some length of pin with a stable base for the pin and socket. In most cases, this is simple except where the flask is built to ride on rollers which interfere with pin length. In such cases, the flasks should be redesigned to allow the roller wheel to ride outside the pin line. Incidentally, such a design has the advantage of faster handling with fewer smashed fingers.

At present, snap-flasks do not have sufficient rigidity to prevent





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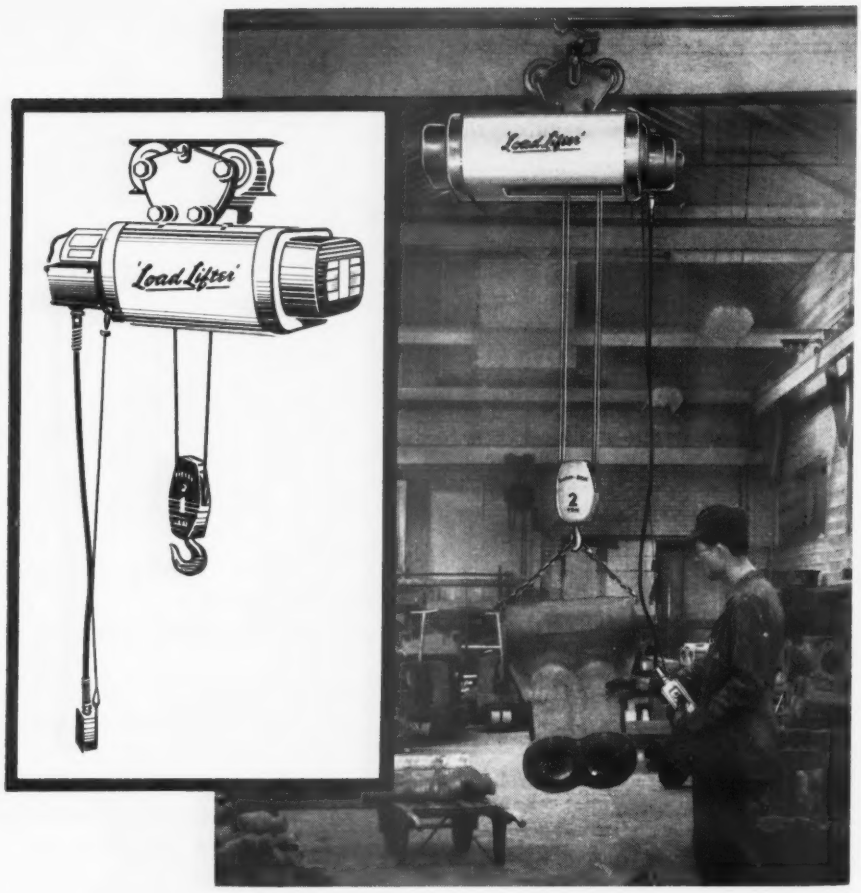

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"breathing" (moving in and out as the load is applied and removed) under high-pressure squeeze, but we see no reason why such designs are impossible or impractical. At the moment then, precision green sand molding is confined to tight flasks but we do not expect this restriction to continue as flask design starts to consider the problems of high-pressure squeeze.

The deep draw pattern involves the same problem as insufficient sand between flask and pattern. In most designs, however, this factor can be controlled by type of squeeze, squeeze pressure and sand flowability. Let us look first at the type of squeeze or the direction of squeeze. The importance of this factor is illustrated in the accompanying sketch. This diagrammatic layout illustrates the difference between flat platen and "diaform" platen squeeze.

Load Moves Directionally

Sand, even when highly flowable, does not act like a liquid. A liquid will transmit an applied load equally in all directions. Sand, on the other hand, tends to transmit most of the load in the direction in which the load is applied. In the case shown in the right side of the figure, the direction is downward. There is some transmission to the side, but not enough to develop a uniform mold density. For this reason, we find soft rams on side-walls and in pockets. If the pattern is quite high, this effect is intensified.

On the right side of the figure we have at least three different densities of ram. At the top, the mold will be extremely hard. On the horizontal surfaces, deeper in the mold, the density will be somewhat lower. On the side-walls deep in the flask, the density will be lowest. This is the old story of swells and rough surfaces on vertical sidewalls and burn-in in deep pockets. The only cure, with a flat platen, is to increase the squeeze pressure until the side-walls have received so much load that they are dense and hard. In many cases, pressures of 600 psi are necessary with this technique.

If the squeeze pressures can be directed toward the pattern, density is obtained with a lower total load. The obvious approach to this problem is to use a flexible squeeze board which will work down and seek out any soft spots. Some success along this line has been found through the use of peening blocks on the squeeze board. This is a step in the right direction but is limited by the fact that the pressure is still downward

and past the pattern. A flexible membrane or diaphragm, on the other hand, can transmit the load both downward and sidewise.

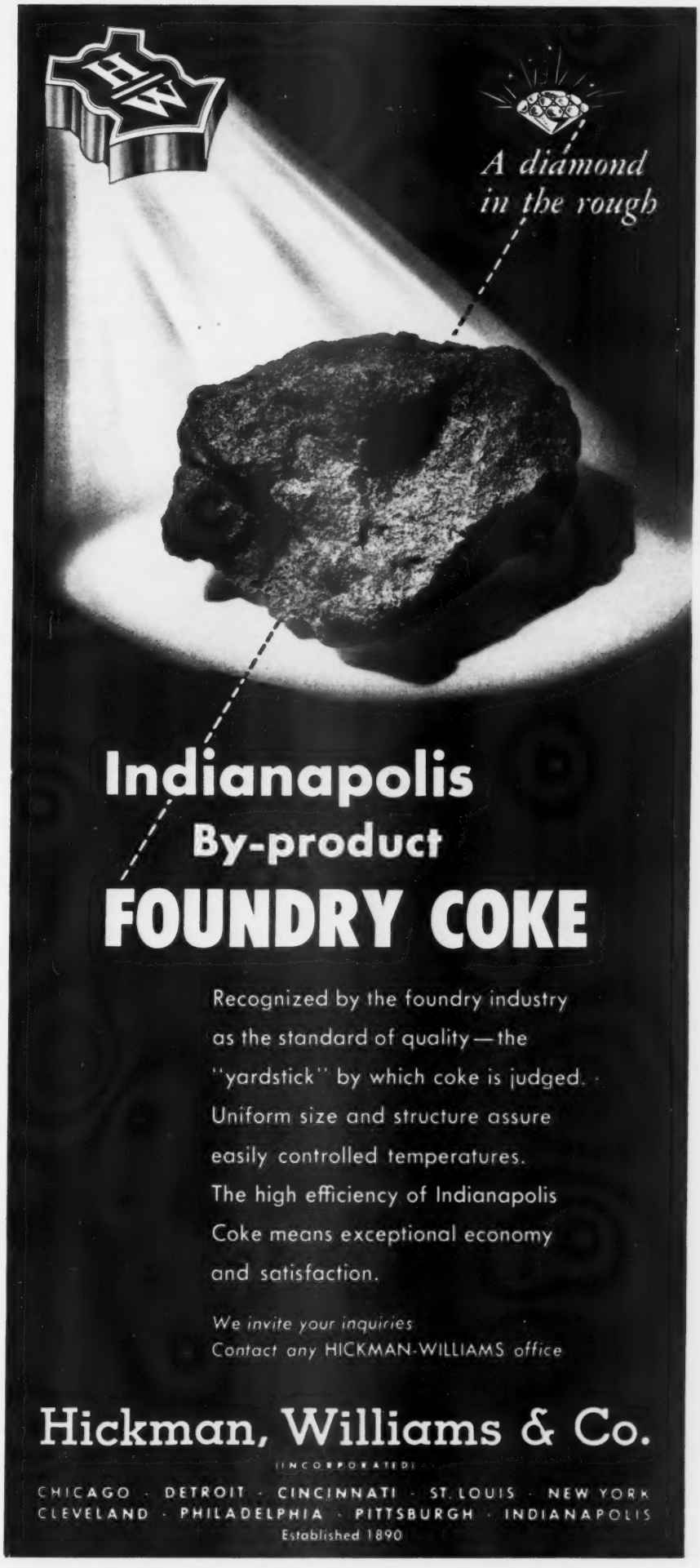
Why the Load Varies — At this point, we can explain why the load on a 20 x 30-in. flask molded at 100 psi varies from 30 to 40 tons depending upon the pattern. A diaphragm exerts equal pressure on every square inch of sand it touches. Because it pushes down into the mold, it creates "hills and valleys." The actual surface will be as much as 40 per cent greater than the apparent area of the flask as measured by a flat platen. The more complicated the pattern, the greater will be the total load exerted on the sand mold.

Incidentally, the principle of a "diaform" platen is not new. Flexible "squeeze boards" are used for forming airplane wings and other engineering shapes and parts. The problem has been one of developing "unstressed" diaphragm and equipment which will permit the technique to be applied to a loose material such as sand.

Inasmuch as a "diaform" platen exerts the same pressure per square inch as the air pressure inside the diaphragm, the pressure may be varied at will, up to the limit of the air-compressor equipment (and boosters) available. The accompanying illustration shows the effect at 80 psi but 100 psi to 120 psi are equally available if the design demands the higher unit pressure.

Sand Flowability—This brings us, in logical sequence, to the third variable — sand. We can now examine sand characteristics in a more logical manner because of the relationship to pattern design and squeeze direction and pressure. Theoretically at least, if the pattern shape is simple and the pressure unlimited, flowability of sand would be insignificant. However, patterns are not that simple, and for economical reasons we wish to use pressures which are readily available. After all, excessive pressure automatically will require excessive weight and rigidity of flasks and equipment with all the attendant costs of handling, maintenance and amortization of equipment. It is only logical to use sands of maximum flowability.

We must first assume a desire for fine sand. Smooth castings and close tolerances can be obtained only from sands of reasonable fineness. Pressure or no pressure, it is still impractical to make a silk purse from a sow's ear. Fine sands, however, immediately intensify the problem of flowability. Extremely fine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sand, by itself, will not guarantee smooth castings and close dimensional tolerance, because of the loss of flowability inherent in such sands.

We have found the optimum combination of fineness and flowability for this work with sands between 90 AFS and 110 AFS. Rounded, partly rounded, or sub-angular grains aid flowability. The screen distribution should be smooth and wide. Best results are obtained when the sand lies on six or seven screens. These sands are frequently called four-screen sands in that there is more than 10 per cent on each of four adjacent screens. However, we have found that if the minor percentages (below 10 per cent) on the other two or three screens are removed, the sands are no longer capable of producing the desired results. Since the four-screen sands do not work unless they actually have six or seven screens represented, we prefer to refer to them as six-screen sands.

Choose Versatile Sand

The amount of flowability which must be built into the job depends upon the requirements of the pattern and the tolerances desired. That does not mean, however, that a special sand need be prepared for each pattern or group of patterns. It does mean that the foundryman must choose a versatile type of sufficient flowability for his toughest job or be prepared to make special sands for special jobs.

Since we are interested in flowability of all the sand in the flask to develop density we probably can not solve the problem by special facing sands. The sand should be such as to preclude the need for facing sands. Fortunately, this practice is also desirable for maximum production and minimum cost. Many small jobs can be produced with nothing more complicated than a typical southern bentonite, low-moisture synthetic sand. Other applications, including deep pockets, difficult draws or danger of cuts and washes will involve the more complex high-flowability sands which develop both toughness and flowability through some form of "chemical bonding."

In any case, the usual considerations of adequate mulling, low moisture, controlled green and dry properties and grain size control are a normal part of precision green sand molding. To some foundries, this merely means a general "tightening up" of sand practice. In some cases, it means special high-flowability ad-

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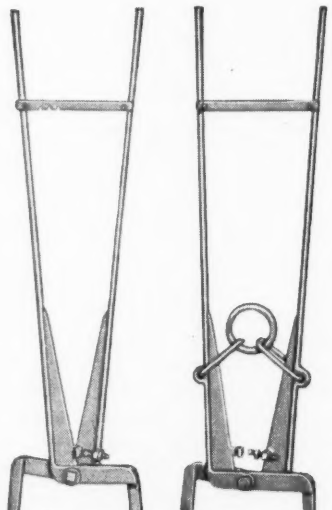
Important new improvement in crucible tongs by Industrial



Now all Industrial Equipment tongs are built with new self-compensating pads on the crossarms to adjust for surface irregularities in the crucible and to add extra safety.

These pads are shaped to fit the crucible. They are mounted to provide adequate strength yet flexible to permit a full pad contact. This eliminates sharp corners, gouging, crushing, and improper tong support. And it is almost impossible for the crucible to slip.

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ditives. To some, it means only proper flask, pattern and molding equipment.

Before leaving the subject of equipment and sand for precision green sand molding, it may be well to touch on versatility, for the sake of the so-called "forgotten man"—the small foundryman. Since the process is only a natural and logical improvement of green sand practice by: 1) Better patterns, 2) higher squeeze pressures, 3) directional or diaform squeeze pressures and, 4) better sand flowability, it is also a most versatile process. The same equipment, same sand and same practice can be modified to make "ordinary" castings. Lowering the pressures permits the use of normal patterns and flasks with normal tolerances. The better sand will, of course, produce better finishes, but that never did any foundryman any real harm.

To summarize, high-pressure molding covers a wide range of pressures. It is actually the science of fitting the pattern, flask, squeeze-direction, squeeze pressure and sand flowability to each other so that all factors blend to develop a dense, firm mold capable of reproducing the dimensions and finish of the pattern. Since it is a green sand practice, it is not limited as to: 1) Dimensions across the parting line, 2) roundness, 3) spherical accuracy, or 4) flatness of "flat-backs."

Molding and sand costs are comparable to green sand, although equipment of this type actually lends itself to extremely high production speeds and lower molding costs if desirable. Casting defects obey approximately the same rules and regulations and, therefore, are avoided (or not) by the usual controls. About the only new feature from the standpoint of casting defects is that we have found that a hard mold does not necessarily imply scabs, buckles or rat-tails. With low-moisture sands, low permeability and hard ram do not necessitate blows. Apparently, the uniformity of dense mold changes some thinking on the effect of a hard ram. So far, we find that casting defects are reduced with a hard, uniform and dense mold of low moisture and high flowability.

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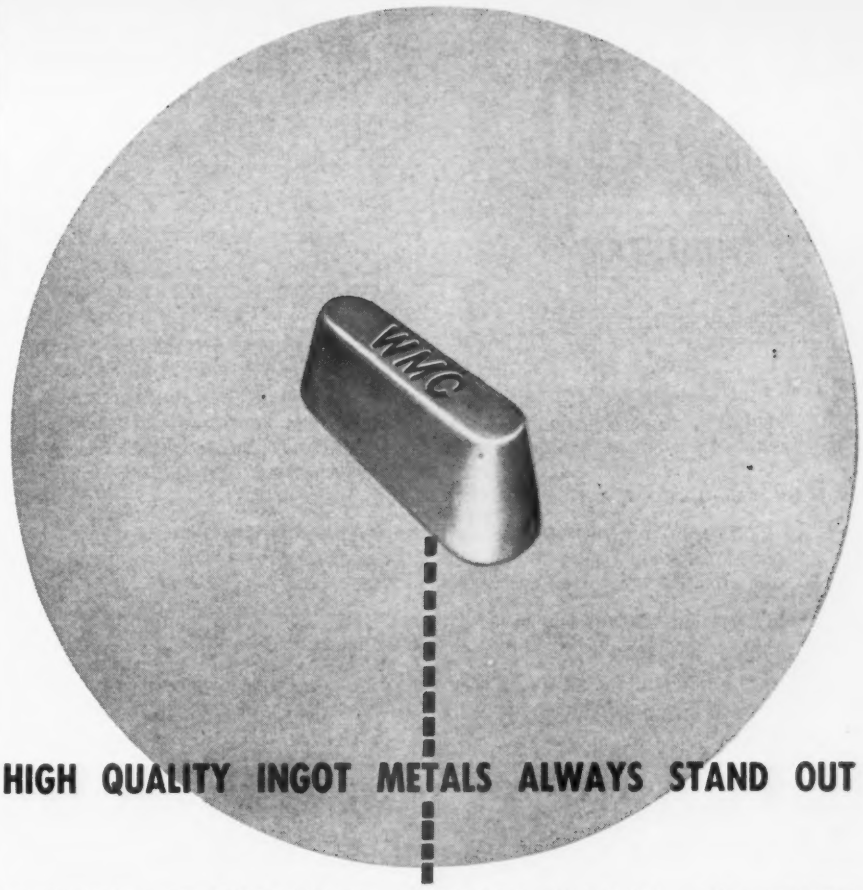

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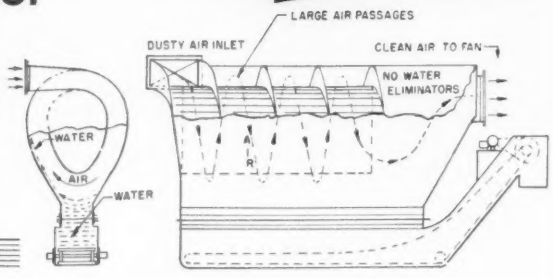

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Progressive Policies

(*Continued from page* 109)

department.

The second foundry section, known as No. 1 foundry, is located in a long, rectangular room with the melting furnaces at one end and cleaning room at the other. Floor and machine molding and shakeout operations are carried on between. Molding equipment includes seventeen jolt squeezers, five plain jolts, two roll-overs and two pairs of cope and drag jolt-squeeze units. Two stationary sandslingers also are used for ramming floor work.

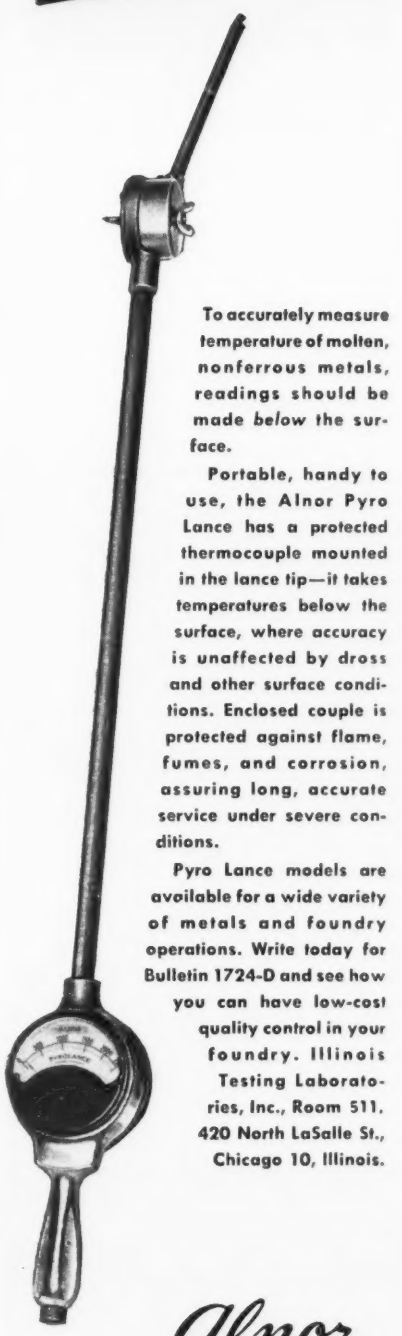
Sand in this foundry is prepared in two 2000-lb and one 1000-lb mullers and is handled in the same manner as in the other foundry section to an overhead distributing belt supplying hoppers above the molding machines. Prepared sand is delivered to sandslingers and to floor molders by scoop trucks.

Conveyorized Sand Handling

Surplus sand from the distributing belt is spilled to a chute feeding a below-floor-level cross belt conveyor, which delivers into a below-floor-level return belt, running nearly the length of the foundry. Sand from a shakeout in the middle of the room, where smaller castings in this section are shaken out, falls to this belt as does the sand from various mold breakout points. The latter consists of gratings in the floor which permit sand to fall through but hold the castings from the broken molds. The return belt feeds a bucket elevator, which discharges at the top onto a belt conveyor. This conveyor delivers the sand to a shakeout on a platform about 3 ft above the floor level and about two-thirds the length of the bay from the furnace area. Sand from this shakeout falls to a belt conveyor and is handled in the same manner as in foundry No. 2 to a 200-ton capacity hopper above the mullers.

Three traveling bridge cranes traverse this entire foundry section. One crane charges one of the melting furnaces and handles teapot ladles during tapping, placing them either on the ladle car serving the snap flask foundry section or on stands from which it can tilt the ladles for filling bottom pour ladles handled by a second crane. This crane pours molds and handles shakeout operations of the smaller castings at the middle shakeout. The third crane moves the large poured molds to the shakeout on the platform. This it does by stacking four of five of them on the floor and then moving the stack to shakeout, placing

in nonferrous foundries SURFACE INDICATIONS CAN BE MISLEADING



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the stack on the floor and lifting one mold at a time to the shakeout.

These larger castings are carried to the cleaning room by the crane, which also takes the empty flasks back to the molding floor. Castings from the middle shakeout are loaded into boxes and carried by the second crane to the cleaning department.

In the cleaning room castings first go through a table type airless blast cleaning machine; then the heads are cut off with oxyacetylene torches or with one of four swing grinders, and the castings loaded on skids. Skids are moved by electric platform trucks to pneumatic hand grinding and chipping operations and to welding, also followed by grinding and chipping.

The trucks then move the castings to the annealing department where they are loaded by overhead bridge crane to racks on the cars for the car-type furnaces. Furnaces are heated by combination oil-gas burners electrically controlled to maintain a temperature between 1600 and 1650° F. Annealing cycle is 7-8 hr. Following annealing, the castings are shot blasted to remove scale and inspected.

Castings Are Heat Treated

Castings from No. 1 foundry to be heat treated are moved to that department by truck. All castings from No. 2 foundry come into this department for sorting. The department is equipped with eight furnaces, some equipped with straight oil burners, some with conversion oil-gas burners. Facilities also are included for both oil and water quenching and tempering. A specialty cleaning shop located here is equipped with sand blasting, tumbling and grinding equipment for cleaning castings to be processed into completed parts at Farrell-Cheek or to fulfill special requirements of customers.

Also available are a 100-ton, two 25-ton and a number of smaller straightening presses. Inspection facilities include a 220,000-v x-ray machine, a cobalt 60 source and holder, and Magnaflux equipment.

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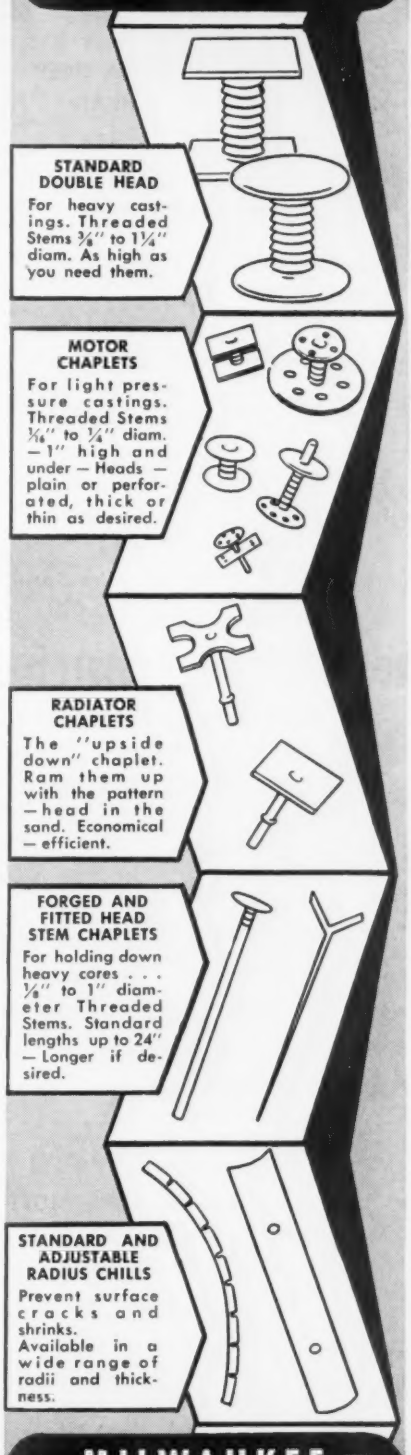

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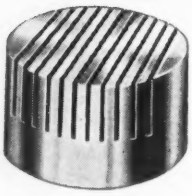

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DEEP HEAD
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Wide or Narrow Slots
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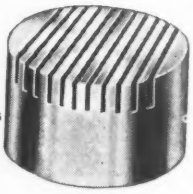

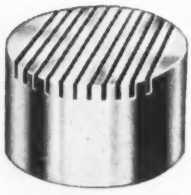

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sand from a chute at bottom of the silo to the elevator, thus moving sand from silo to muller supply hopper.

Both oil and resin bonded sands are mixed in the 1000-lb muller. Other additives are the usual cereal, bentonite, iron oxide, dextrin and water. Sand and other dry additives are dumped into the muller by a skip hoist, and water is metered. Following a 7-minute mulling cycle, sand is discharged through a fluffer to bottom-gated buckets suspended by electric hoist from an electrically propelled overhead monorail carrier. Through switching arrangements the carrier delivers sand to the 14 core-making benches located along a slider belt leading to a tower oven, or to the four bench type core blowers. To supply the four floor type blowers, the bucket is transferred to a carrier operating on a higher monorail, which permits dumping sand in the machine's hoppers. This comprises the oil sand operation. The baking cycle is 2 hr in the oil-gas fired tower oven..

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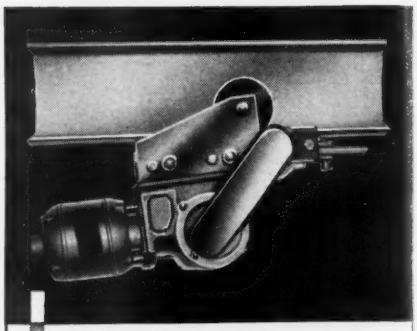
Resin cores are made on three jolt tables, two of which are serviced by an overhead bridge crane for handling large cores. Cores are rolled out on roller conveyors and placed on racks for baking in four batch-type oil-gas fired ovens. The cycle is 2 to 5 hr, depending upon size and shape of the cores. Racks are removed from these ovens by platform lift hand trucks and placed on the floor to cool under a hood vented directly to the outside through a roof fan. Cores are given the usual definning, pasting and washing treatment and then are sorted by job number into tote boxes. In the case of No. 2 foundry, all patterns are delivered to the coreroom and are placed with the cores for the job. A ticket bearing the customer's name or number, pattern number, the number of different cores for each mold, the number of molds to be made and the type of steel to be poured is placed with the lot and the whole assembly delivered to the molder as a unit package.

A small pattern shop is maintained in the foundry for gating and risering and making minor changes in patterns. All major pattern work is sublet to outside shops. Patterns are stored in shelf bins in very orderly row fashion with aisles wide enough to accommodate small trucks.

Melting department is equipped with two electric furnaces. Charges for the 8000-lb, top-charge model are made up in drop-bottom buckets rest-



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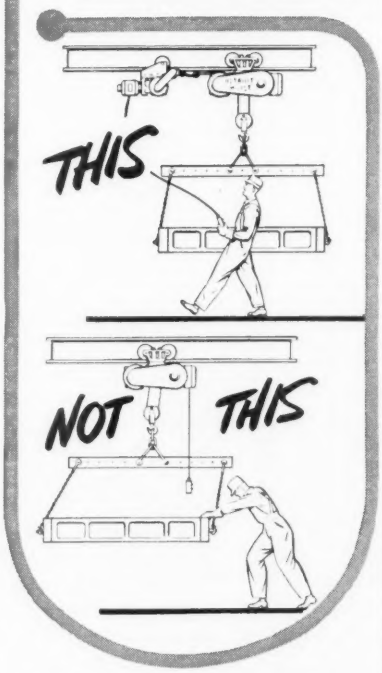

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ing in floor pits. Charges consist of home and purchased scrap stored in bins near the furnaces and collected in large boxes carried by a fork lift truck, transported to a floor scale for weighing and then dumped into the charge buckets. Loaded buckets are hoisted by crane as previously described and lowered into the furnace. A rope, which holds the drop bottom in place for moving the load burns off in the heat of the furnace to release the door and drop the charge.

The 6000-lb furnace is a side-door-charge model. Charges are weighed in long, narrow boxes with one open end, resembling chutes. To charge the furnace, the lift truck places the open end in the charge door, then lifts the other end, allowing the material to slide in.

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Case Offers Computing Machine Conference

A two-day conference on the applications of computing machines will be held on the campus of Case Institute of Technology, Cleveland, Apr. 13-14. Primary objective of the conference will be to demonstrate the usefulness of differential analyzers and programmed calculators to industrial problems.

The conference, aimed toward engineering research personnel, will include discussion and demonstration of scientific application of mechanical and electrical computing machines that can be put into everyday use by individual research laboratories and still remain within budget limitations.

Society Plans Clinic

Instrument Society of America will hold its third annual Analytical Instrument Clinic in conjunction with the first International Instrument Congress and Exposition at Philadelphia, Sept. 13-24.

The clinic will be a lecture and demonstration course planned primarily for technicians, engineers, physicists and chemists who are using or plan to use the various instruments that will come under discussion.

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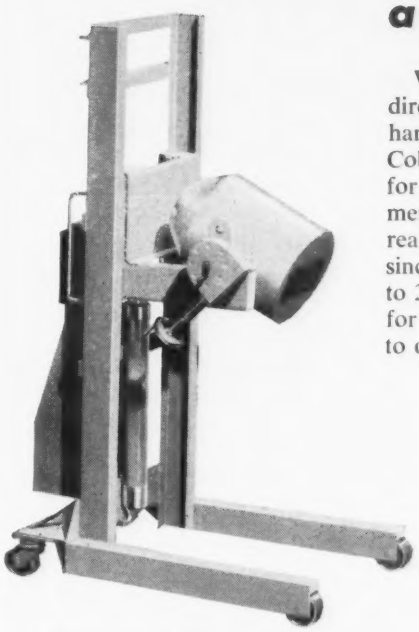

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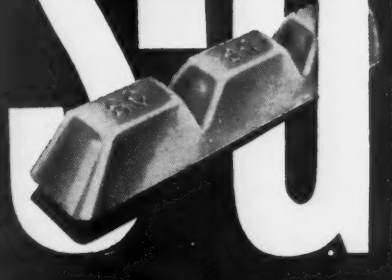

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Cold Cracks

(*Continued from page* 123)

the casting to cool homogeneously, no plastic deformation would be induced, and thus no residual stresses would occur. This is difficult to obtain except in cases where some type of stress relief heat treatment is possible. However, since no attempt is being made to eliminate stresses but only to reduce them, it is necessary only to approach this condition.

Design Is Important—In any attempt to produce uniform cooling, the first consideration should be in the casting design. It is at this point where the tendency toward cold cracking in introduced. And it is here that the foundryman should examine critically the designer's ideas and determine whether factors affecting cold cracks are minimized to the greatest extent. If the foundryman has a job of long standing which is giving trouble, he should not hesitate to analyze it from the standpoint of the mechanism of cold cracking and ask for design changes; it often will happen that the concessions he asks are granted easily.

To obtain uniformity in cooling it is desirable to attain uniformity in ratios of mass-to-surface area in the various members of the casting. For instance, in the example of the hub it could be that increasing the thickness of the flange by about 10 per cent might be enough to affect the stress development favorably. Or reducing the thickness of the hub could help. Increasing the thickness of the hub might help by adding mechanical strength which would help to hold the stress in check, but it also might aggravate a tendency to hot tear as mentioned previously.

At any rate, the foundryman can make sample castings within his own shop to prove his theories and, if they are satisfactory, can present them to the customer for approval. However, since one of the great advantages of the casting process is the economical production of complicated shapes, it might happen that continuous requests for simplification may result in a part that can be made more cheaply by some other process. Since the foundryman would not be wise to design himself out of business, he should look for other means to solve his problem.

Consider Gating—In shop practice there are many techniques which can be employed to promote even cooling. An element which has a profound effect on the cooling of a casting is the manner in which it is gated. While gating into the thinner sections is not acceptable from the standpoint of solidity it is possible in some

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instances to use auxiliary gates into the light sections. In this manner the original temperature of the metal can be raised in the lighter sections so that the temperature differential, which persists during cooling, is not so great.

The size of feeders which are attached to the heavy sections should be as small as is consistent with the production of solid castings. Overly large feeders tend to hold heat in the heavy sections and increase thermal differentials. Occasionally, the use of chills on the heavy sections is advisable to promote more rapid cooling. However, since most of the thermal capacity of chills is used up during solidification, only quite large chills are of much value and then only in small castings.

Shakeout practice is worthy of important consideration when castings of cracking tendencies are being produced. Very often the lighter sections are uncovered more quickly when the molds are dumped, and this of course results in a drastic effect on the cooling. Where hub cores tend to be difficult to remove, they prevent easy access of air to the heavy section and hinder its already slow cooling. A practice followed in many foundries is to allow castings with a cracking tendency to cool in the molds for prolonged periods, in some cases to room temperature. When the practice does not tie up equipment and floor space this treatment often will be successful in reducing temperature differentials and thus, cold cracks.

Another practice which has been very useful is that of "hot potting." This consists of building a hot fire in a suitable receptacle and placing the castings in it as quickly as possible after pouring. The heat of the fire tends to slow the cooling of the light sections and allow the whole casting to approach uniformity in its cooling process.

Speed Cooling — Another approach to the problem used in some foundries is that of hastening the cooling of the heavy sections by the application of water. This is done by spruing the casting shortly after solidification and before shakeout (hot spruing), removing the riser at the heavy section, then pouring water into the void previously occupied by the riser. This approach has some theoretical merit but it also results in excessive wetting of the molding sand.

Whenever two or more foundrymen gather to discuss the cracking tendencies of castings the subject of metal and melting enters. It is not the purpose here to add fuel to the fire except to state that it is evident that the high-temperature physical properties of white iron must have

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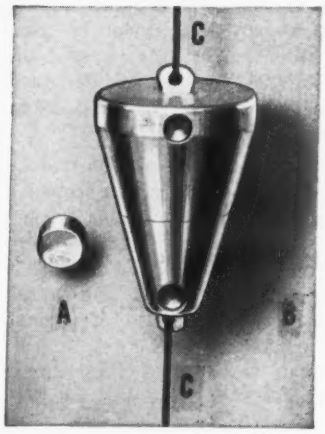

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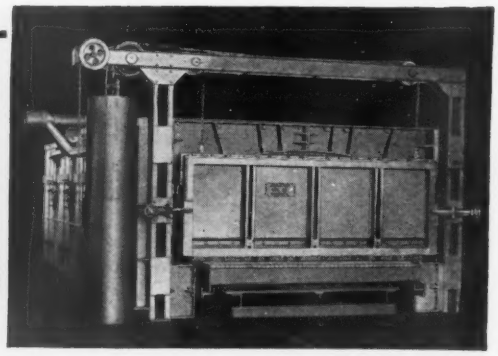

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great effect on its tendency to crack. Since it is known that melting practices can affect room-temperature properties of metals, it would seem possible that high-temperature properties also could be affected. However, it would seem unwise for the foundryman not to assume responsibility for cracking and to take the best steps he can to prevent it.

Use Heat Treatment—Probably the most effective means of preventing cold cracks is the use of a stress relief heat treatment. While this involves the need for additional expense in an operation where there is no improvement in the finished product since, as previously pointed out, malleable iron is stress relieved in the malleablizing anneal, it may still be economically feasible if it saves a large percentage of castings or makes possible the acquiring of business which otherwise would not be profitable. Fuel cost of the process can be relieved somewhat by devising a means of placing the castings in the heating furnace while still red hot. In fact, such a procedure is advantageous from another viewpoint. If placed in the furnace while hot, the castings have not yet developed very great stresses and thus the stress is relieved more quickly than it otherwise would be.

Essentially, this type of stress relief may be done by shaking out soon after pouring and placing the casting in the furnace at about 1200° F, holding until the entire casting is uniformly at temperature, allowing slow cooling to 1100° F or lower, and removing from the furnace, allowing cooling to room temperature in air. Since the casting cools slowly and uniformly through the period when it loses its ductility, plastic deformation is retarded and any strains produced are of an elastic nature and are dissipated during further cooling. Careful control of temperatures is required but, if this is not possible, longer cooling to lower temperatures will help somewhat to overcome the deficiencies.

The problem of cold cracking probably will continue to be with the malleable foundryman who produces complicated castings of the larger sizes. The characteristics of white iron itself and the process of founding, as we know it now, cause it to be more susceptible to this difficulty than most other metals. Each design will present its own problems and analysis of them may suggest a remedy. Perhaps the only general statement that can be made is that since strength of the casting is reduced by the amount of stress retained, and highly stressed castings will fail under comparatively light impact, care in handling is imperative.

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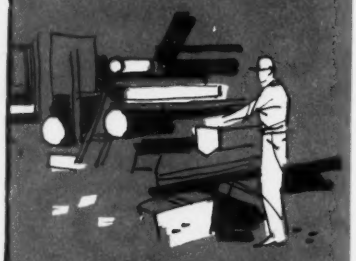

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Gating Factors

(*Continued from page* 107)

The use of ingates of flared, streamlined or other designs as shown in Fig. 9 was investigated in the early phases of the Naval Research Laboratory studies and found to provide no benefits over the simple circular or square shapes. This is to be expected since conditions of metal flow in the runner determine the velocity and uniformity of flow from the ingates.

Finger Gates—The flow patterns which are developed in the mold cavity due to various types of finger gates described in the previous sections are illustrated in Fig. 10. Non-uniform flow generally creates a swirl condition in the casting, while uniform flow creates a rolling action. High-velocity flow produces a jet effect with spatter and undesirable cutting action on the sand.

The type of flow obtained in the gating system and the flow pattern developed in the mold cavity do not depend on the type of metal. The same type of flow is obtained from a given system irrespective of metal type. This should be expected since the hydraulic principles which determine the condition of flow are equally applicable to all liquids.

Step Gates—The primary purpose of step gates differs from that of finger gates in that sequence flow rather than uniform flow is desired. The same hydraulic principles are of course applicable to the solution of step gating problems.

The action of the pouring cup in determining the rate of metal flow into the sprue is exactly the same as for the case of finger gate systems. The sprue serves a dual function in that it must also distribute metal to the ingates as is the normal function of the runner in the case of finger gate systems. If considered in this light, it is evident that a pressurized sprue will distribute metal from the ingates in the fashion of a pressurized runner and a partially filled sprue will act in the fashion of an unpressurized runner insofar as ingate flow is concerned.

Since sequence flow is desired, it is evident that the sprue cannot perform its function properly in step gates if pressurized. Therefore, it is first of all essential to eliminate pressurization in the system. The only course that remains, therefore, is that of controlling the kinetics of flow.

Fig. 11 (top) illustrates several step gating systems which do not function in sequence because of unfavorable hydraulic conditions. System (A) is not pressurized but the

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kinetic effects are such as to cause continuing flow from the bottom step throughout the pouring period. Tapering of the sprue (B) causes pressurization and consequently simultaneous flow from all steps. Pools (C) do not function correctly because pressurization is developed in the topmost pool and consequently flow occurs primarily from the topmost ingate throughout the pouring period.

Fig. 11 (bottom) illustrates successive stages in the operation of a successful system which utilizes reversed flow to direct the metal along what may be considered a vertical runner. Pressurization of the sprue is permissible because of the addition of the vertical "runner". Sequence flow occurs since the height of the metal in the sprue is always somewhat higher than that in the casting due to a tendency (resulting from kinetic effects) to follow a straight line path up the vertical runner following the reversal of flow direction.

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8. "Step Gating," W. H. Johnson and W. O. Baker, 1949 (film).
9. "Choke Control in Finger Gating," W. H. Johnson, 1950 (film).

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A new plant will be erected on a 100-acre tract of land outside Benton Harbor, Mich., by Clark Equipment Co., Buchanan, Mich., manufacturers of industrial materials handling trucks, construction equipment and heavy automotive components. Construction will start immediately, and the plant is expected to be in operation before the end of 1954.

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TRADE PUBLICATIONS

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For More Details Circle No. 121—Page 235

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FAN ENGINEERING: Hartzell Propeller Fan Co., Piqua, O.—Fan laws and formulas, terms and definitions, recommended velocities, an air pressure conversion table, charts covering duct resistance, entrance losses, rectangular equivalents of round ducts, installation, maintenance and lubrication techniques and other data are discussed in bulletin A-108.

For More Details Circle No. 123—Page 235

ALUMINUM ALLOY CASTING: Federated Metals Division, American Smelting & Refining Co., 120 Broadway, New York 5—The effect of moisture, shrinkage, dross, pouring temperature, test bars, and other subjects are discussed in a 20-page bulletin, "Practical Help in the Casting of Aluminum Alloys."

For More Details Circle No. 124—Page 235

PATTERN COATING: Kindt-Collins Co., 12651 Elmwood Ave., Cleveland 11—Read the story of the technology, scientific research and proving that have gone into the development of a new coating for wood and metal patterns in a reprint, "Research in Pattern Coating Produces Quality Castings."

For More Details Circle No. 125—Page 235

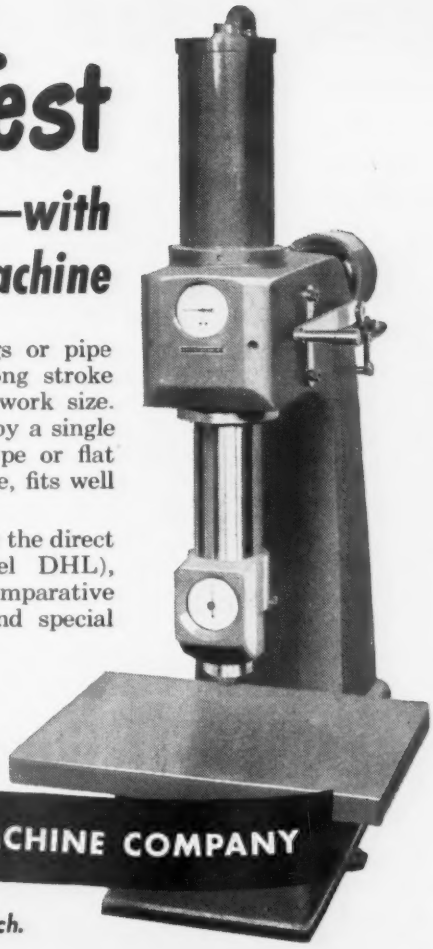
VACUUM METALLURGY: National Research Corporation, Dept. M, 70 Memorial Dr., Cambridge 42, Mass.—Recently published articles on vacuum metallurgy concerning vacuum furnaces used for vacuum-melted metals and alloys, and properties and applications of the metals now are available in reprint form.

For More Details Circle No. 126—Page 235

FELT: Bacon Felt Co., Taunton, Mass.—If you use felt in your products or processes you should obtain some help from this descriptive catalog on wool felt wheels, bobs and sheets and hair felt sheets and

Brinell Test

large pieces fast—with this long stroke machine



Large awkward castings, forgings or pipe are easily tested because the long stroke eliminates screw adjustment to work size. The hydraulic ram is controlled by a single lever. Large, stationary roller-type or flat table makes work handling simple, fits well into a conveyor line.

Choice of plain Brinell machine or the direct reading machine (shown, model DHL), where dial at end of ram gives comparative hardness immediately. Larger and special machines may also be had.

Write for more information on all our Brinell testing machines.

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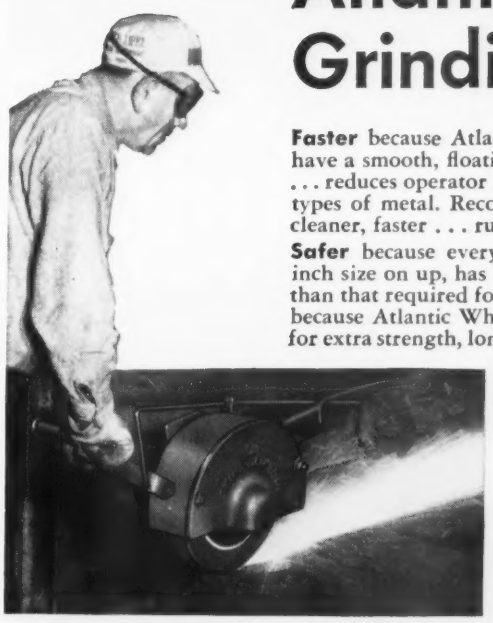
Making WHEEL WORK faster . . . safer . . . more economical

Atlantic Speed-Tested Grinding Wheels



Faster because Atlantic Speed-Tested Grinding Wheels have a smooth, floating action that requires less pressure . . . reduces operator fatigue . . . speeds up grinding on all types of metal. Records prove that Atlantic Wheels cut cleaner, faster . . . run cooler on job after job.

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ATLANTIC ABRASIVE CORP.

South Braintree 85, Massachusetts

wheels. Table on felt wheel selection, specifications, "how-to-do-it" hints, and physical and chemical properties of various sizes and grades of felt are included.
For More Details Circle No. 127—Page 235

ELECTRIC HOIST: Coffing Hoist Co., Danville, Ill.—Cut-away drawings, dimensions, specifications, and safety features of hoists with capacities from 500 to 4000 lbs are shown in bulletin QL.
For More Details Circle No. 128—Page 235

CONTRACT FOUNDRY: Franklin Balmar Corp., Woodberry, Baltimore 11—Illustrated catalog describes the company's foundry and machine shop facilities including engineering service, foundry and pattern shop, machine shop, weld shop, sheet metal shop, forge shop, heat treating and laboratory for the production of a variety of castings and machine shop products.
For More Details Circle No. 129—Page 235

"S" MONEL: International Nickel Co. Inc., Development & Research Division, 67 Wall St., New York 5—You can learn all about the engineering properties of "S" Monel, an age-hardenable casting alloy that provides strength, hardness and antigalling properties at temperatures up to 1100°F in the booklet, "Engineering Properties of 'S' Monel."
For More Details Circle No. 130—Page 235

CORE BAKING OVENS: Girdler Corp., Thermex Div., Louisville 1—Illustrated case histories point out the experiences of others in using a single self-contained unit for electronically baking foundry sand cores. Diagrams and specifications are included in the booklet.
For More Details Circle No. 131—Page 235

GYRO-VISE: Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland 4—Price data, specifications, and action photos showing commercial applications of a new vise which rotates around a standard base are described in a recently issued catalog page.
For More Details Circle No. 132—Page 235

MANGANESE BRONZE: R. Lavin & Sons Inc., 3426 South Kedzie Ave., Chicago 23—Write for informational folder, Vol. 9, No. 4, containing an article "Gates & Risers for Manganese Bronze." Detailed diagrams and a specification, chemical composition and physical property chart are included.
For More Details Circle No. 133—Page 235

AIRLESS BLAST BLADES: Taylor-Wharton Iron & Steel Co., High Bridge, N. J.—Leaflet describes high durability replacement blades for airless blast cleaning equipment. Having Rockwell C hardness of 65 and brinell hardness of 700, the blades are ground to gage on all fitting dimensions.
For More Details Circle No. 134—Page 235

HANDLING EQUIPMENT: Stephens-Adamson Mfg. Co., 23 Ridgeway Ave., Aurora, Ill.—The company's complete line of standard products is included in bulletin 653. Additional information about specific products can be obtained by referring to catalog numbers provided in this bulletin.
For More Details Circle No. 135—Page 235

POLISHING MAGNESIUM: Norton Co., Worcester 6, Mass.—Technical Bulletin 532 covers typical procedures for grinding and polishing magnesium alloys. Dust collection systems and general safety precautions for grinding and polishing operations also are discussed.
For More Details Circle No. 136—Page 235

VIBRATING FEEDER: Richardson Scale Co., Van Houten Ave., Clifton, N. J.—A new vibrating feeder that operates at near resonant frequencies is pictured and described in data sheet 5302 with a list of specifications and an explanation of operating principles.
For More Details Circle No. 137—Page 235

FURNACE CONTROLS: Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Aves., Philadelphia 44—Newest edition of

Increase Production: Reduce Costs!

Use MD 180 IRON POWDER for CUTTING and SCARFING

You can reduce costs and increase production by the fast action of MD 180 IRON POWDER in your Cutting and Scarfing operations.

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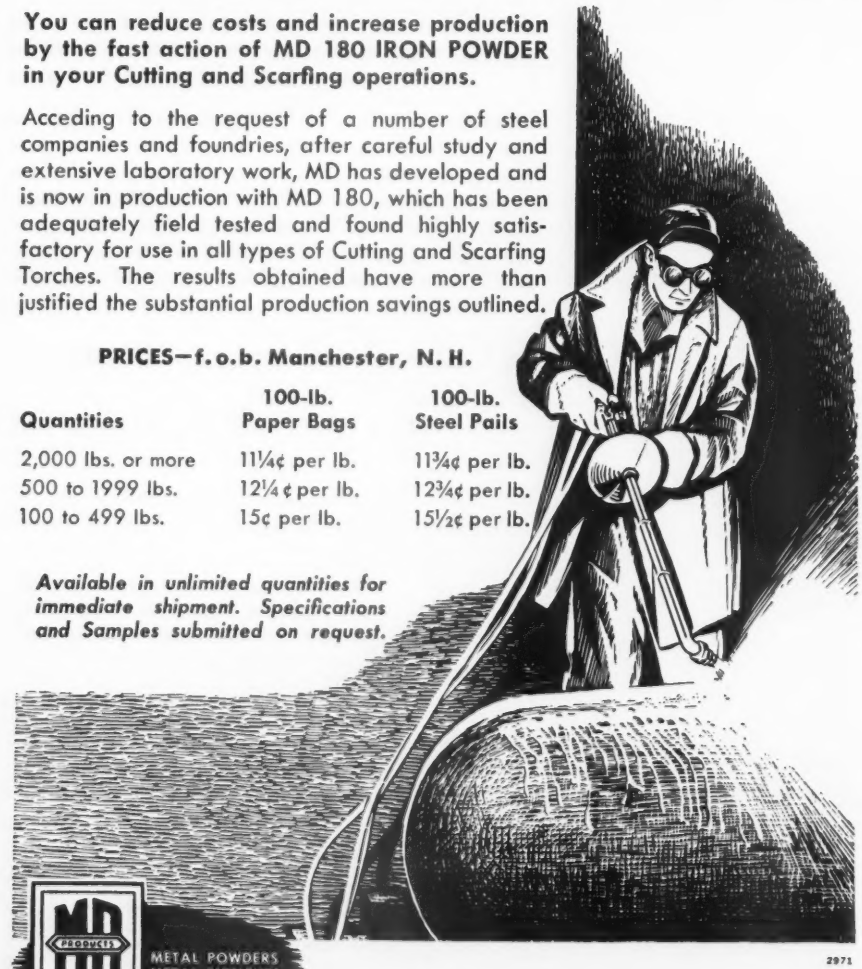

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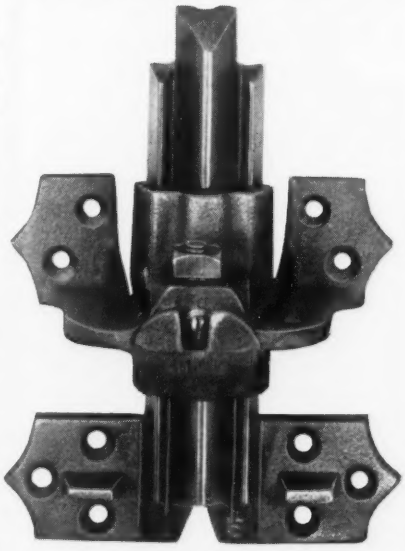
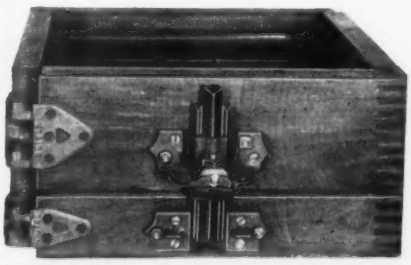


& MATCH PLATE LUGS

TRU-LIFT Flask Guides and Match Plate Lugs are designed around a principle used by many production foundries for more than 30 years. This feature comprises a multiple of 3 V-Shaped projections on the pin surface, and 3 V-Shaped grooves on the sliding surfaces of the cope guides. Thus, with the use of TRU-LIFT you get a *straight vertical lifting of the cope,* and removal of the Match Plate, similarly. TRU-LIFT guides are simple to install . . . let us send you a trial set for your examination and use.



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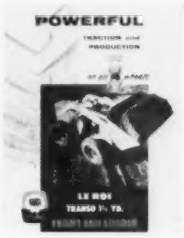
furnace and oven controls condensed catalog and price list 53-1 includes data on temperature controllers, program controllers, combustion safeguard equipment, valves and accessories.

For More Details Circle No. 138—Page 235

ELECTRIC VIBRATOR: Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13—A new electric vibrator is introduced that will handle any granular material in an almost noiseless operation while still delivering an extremely heavy impact for its weight. Price list and engineering data are included in catalog No. 10.

For More Details Circle No. 139—Page 235

FRONT LOADER: Le Roi Co., 1706 South 68th St., Milwaukee 14—



Liberal use of photos and sketches point out the many features of a 1½-yd loader with bucket rocking action and four-wheel drive traction. A unitized design provides compact rear arrangement of engine, transmission, clutches, torque converter and axle assembly to assure simple maintenance. Power steering is standard but in event of a power failure steering reverts to normal full manual control. Detailed specifications and technical data are included.

For More Details Circle No. 140—Page 235

QUALITY CONTROL: Baird Associates Inc., 33 University Rd., Cambridge 38, Mass.—The story of one scientific method of quality control used in speedy quantitative analysis of molten metal from which blocks, cylinder heads, flywheels and other automotive parts are made is told in an illustrated booklet.

For More Details Circle No. 141—Page 235

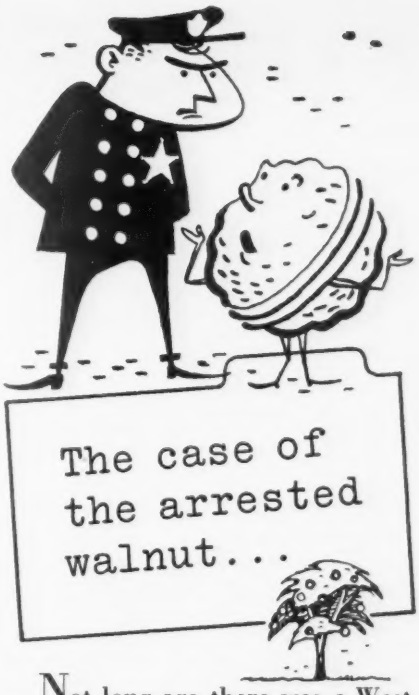
SCALE MODELS: Knight Models Inc., 600 West Jackson Blvd., Chicago 6—Folder shows how three-dimensional scale models can be used to advantage in plant layout, site development, architectural and structural planning, product development and sales programs.

For More Details Circle No. 142—Page 235

GRINDING: Carborundum Co., Niagara Falls, N. Y.—A booklet called "Grinding Cemented Carbides with Green Grit and Diamond Wheels" describes methods and procedures as well as the necessary abrasive products for grinding cemented carbides.

For More Details Circle No. 143—Page 235

PRESSURE-TIGHT CASTINGS: Meehanite Metal Corp., 714 North Ave., New Rochelle, N. Y.—Illustrated bulletin 43 contains information of specific industrial applications of Meehanite castings where



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It gave those walnut trees a bad time . . . kept those walnuts moving like tomorrow's neighbor . . . and left the walnut grower beaming happily.

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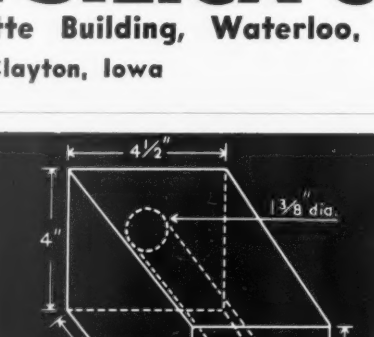
How to eliminate slag hole failures



Operators of continuous pour cupolas report 20 or more hours steady service from CARBOFRAX silicon carbide blocks —with practically no change in hole size. Result: no slag hole failures, no costly shutdowns.

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specifications demand absolute density, uniformity and resistance to various pressure ranges. Engineering property charts and pressure casting design suggestions also are included.

For More Details Circle No. 144—Page 235

ALUMINUM SILICON ALLOYS: Foundry Services Ltd., Long Acre, Nechells, Birmingham 7, England—Revised information sheet 16 offers data on the heat treatment, casting characteristics, chemical composition, mechanical properties, melting procedures and molding techniques of aluminum-silicon alloys.

For More Details Circle No. 145—Page 235

MAINTENANCE CONTROL: McCaskey Register Div., Victor Adding Machine Co., 101 West 31st St., New York 1—Send for this bulletin if you want information about maintenance control, material or quality control, or other industrial controls that can be tailor-made to fit your operation.

For More Details Circle No. 146—Page 235

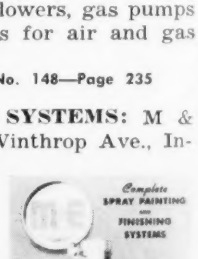
WIRE ROPE: Leschen Wire Rope Division, H. K. Porter Co., 5909 Kennerly Ave., St. Louis 12—Seventeen "life-saving" tips for improving wire rope service are listed in a folder entitled "How To Get More Out of Your Wire Rope."

For More Details Circle No. 147—Page 235

BLOWERS AND PUMPS: Sutorbilt Corp., 2008 East Slauson Ave., Los Angeles 58—Bulletin 59D describes construction, operation and other features of blowers, gas pumps and vacuum pumps for air and gas handling.

For More Details Circle No. 148—Page 235

PAINT SPRAY SYSTEMS: M & E Mfg. Co., 2571 Winthrop Ave., Indianapolis 5 — Catalog G - 54, designed primarily for operating personnel, purchasing agents and processing engineers, is devoted to information about the industrial application of paint spray equipment, including descriptions of material ranging from a small hose connection and spray guns through air compressors, exhaust fans, water wash paint spray booths to the largest complete finishing and air replacement system.



For More Details Circle No. 149—Page 235

TESTING MACHINE: Baldwin-Lima-Hamilton Corp., Philadelphia 42—Weighing system, construction, automatic operation and uses of a universal testing machine of 50,000-lb capacity are discussed in bulletin 4206.

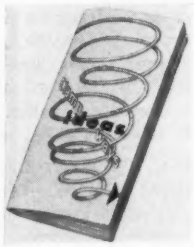
For More Details Circle No. 150—Page 235

ALLOY BILL-ETTES: Charles Dreifus Co., Lincoln-Liberty Bldg., Philadelphia 7—Condensed list contains pricing information on more

than 30 certified alloy melting billets for the investment casting industry.
For More Details Circle No. 151—Page 235

DESIGNATION CHART: Empire Steel Castings Inc., Box 139, Reading, Pa.—A designation chart giving the chemical analysis, mechanical properties, heat treatment and uses of 18 carbon and low alloy steels is offered in bulletin 253-LA.
For More Details Circle No. 152—Page 235

HOSE CLAMPS: Punch-Lok Co., 321 North Justine St., Chicago 7—Case histories of unusual uses for hose clamps are compiled in a booklet, "Clampways Ideas," prepared so that similar applications in your operation can save time and money. The manufacturer reports a wide range of uses for hose clamps and provides a sectional view of this particular clamp to give an indication of its many applications for original equipment, maintenance and repair work.



For More Details Circle No. 153—Page 235

GAMMA RAY TESTING: Gamma Industries Inc., P. O. Box 1469, Baton Rouge, La.—How to look inside castings to spot hidden defects is pointed out in illustrated brochure on the techniques of nondestructive testing with gamma ray machines.
For More Details Circle No. 154—Page 235

AIR-POWERED PUMPS: Milton Roy Co., 1500 East Mermaid Lane, Philadelphia 18—One method of solving low capacity flow control problems through use of air-powered controlled volume pumps is shown in bulletin 1053.
For More Details Circle No. 155—Page 235

ELEVATOR BELTING: B. F. Goodrich Co., Akron, O.—Engineering information essential for the selection, installation, use, operation and repair of elevator belts is discussed in 24-page illustrated elevator belting engineering handbook.
For More Details Circle No. 156—Page 235

V-BELTS: Raybestos - Manhattan Inc., Manhattan Rubber Division, Passaic, N. J.—An increase in horsepower capacity over standard belts, resistance to shock loads, and length stability are claimed in Bulletin 6628.
For More Details Circle No. 157—Page 235

MOBILE CRANES: Coles Cranes Inc., P. O. Box 942, Joliet, Ill.—Lifting capacities and specifications of heavy duty industrial mobile cranes to handle lifts up to 23 tons are the subject of a new brochure.
For More Details Circle No. 158—Page 235

PRODUCT LISTING: Bristol Co., Bristol Rd., Waterbury 20, Conn.—A detailed directory of branch offices, trade names, product classification

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For use in:
METAL BLASTING
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Harrison L/D Cut-Wire Shot provides these four outstanding advantages:

✓	LONG LIFE	Lasts many times longer than any cast shot. Stands up against thousands of impacts.
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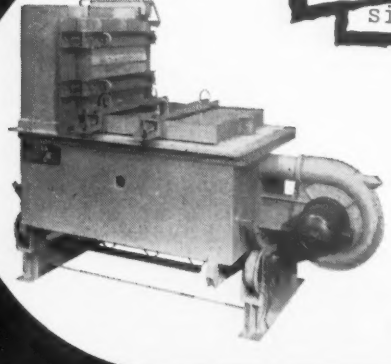
sincerely recommend it . .



Reda Stack-Loading melting furnaces for ferrous and nonferrous metals have been designed and built by experienced foundrymen for foundrymen everywhere. That is why Reda furnaces provide advantages far beyond those found in other, and more expensive types; that is why, with Reda furnaces there is less down time for maintenance, longer uninterrupted melting runs, and lower melting costs.

Another feature is the Reda Burner arrangement which can operate from oil and gas simultaneously or be switched from one fuel to the other instantly. *Write or phone for complete details.*

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list, and a listing of all automatic controlling, recording, and telemetering instruments manufactured by this company are contained in bulletin W1805.
For More Details Circle No. 159—Page 235

INDUSTRIAL FURNACES: Eclipse Fuel Engineering Co., 1001 Buchanan St., Rockford, Ill.—Industrial furnaces ranging from reverberatory and crucible types to pot furnaces are illlustrated and described briefly in bulletin D.
For More Details Circle No. 160—Page 235

SNAGGING WHEELS: Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37—Company offers data in form ESA-62 concerning features, applications, specifications and manufacture of its abrasive snagging wheels for foundries and steel mills.
For More Details Circle No. 161—Page 235

VOLT-AMMETERS: Pyramid Instrument Corp., Lynbrook, N. Y.—A number of time and money-saving applications in measuring current and voltage without shutting down equipment is the subject of catalog 134.
For More Details Circle No. 162—Page 235

CONTROL INSTRUMENTS: Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill.—A description of numerous electronic instruments for industrial process control application is offered in bulletin F 5633-1.
For More Details Circle No. 163—Page 235

WELDING ELECTRODES: General Electric Co., Schnectady 5, N. Y.—Foundrymen can get up-to-date information on the company's complete line of welding electrodes from a 4-page electrode selector chart which has been designated GEC-657E.
For More Details Circle No. 164—Page 235

FLEXIBLE TUBING: Penflex, 72nd St. & Powers Lane, Philadelphia 42—Scientific application of flexible steel, bronze and aluminum tubing and hose for air, oil, steam, gases and volatiles is explained in an eight-page illustrated data book.
For More Details Circle No. 165—Page 235

"The employment man said foundry work was no picnic, but I still get sand in my food!"

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PLUS 5 SERVICE

to put extra push behind your sales program

What is PLUS 5? It's your key to more business from foundries. It gives every FOUNDRY advertiser a bonus he can get from no other source. Here is help in analyzing this market—studying sales territories and potentials—planning the sales effort—and creating a constructive promotion program to the 5 billion dollar foundry market. It's time to take a new look at this market—and at the unusual selling aids we have for you. Say PLUS 5 to your FOUNDRY representative and he'll show you this 5-step program designed to move more of your products into foundries.

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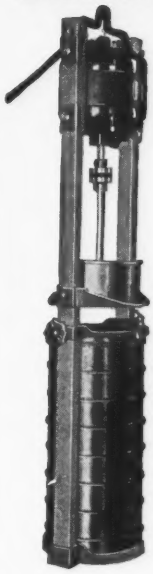
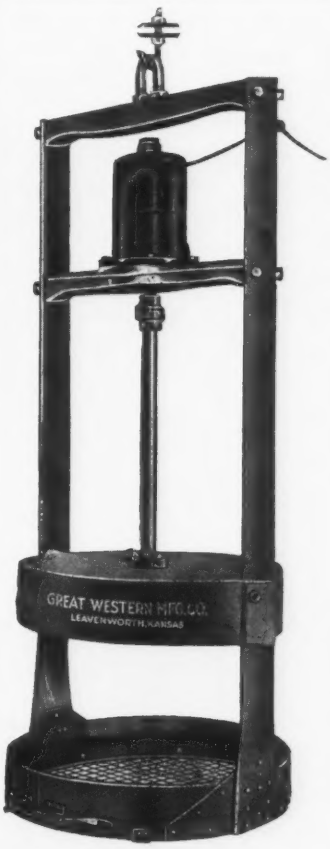
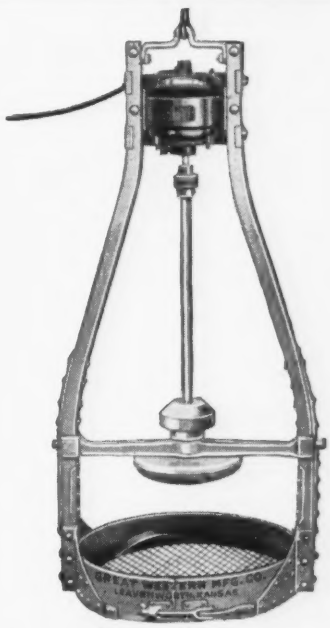


Type "HL" Lab Sifter for sand control $225.00 without sieves

Type "CS" with 24 square screen and automatic discharge $320.00



Type "CR" with 24" sieve $310.00



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but pretty silly on a user of castings

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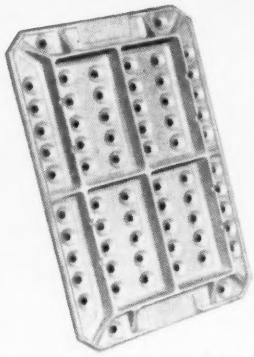

Underside view of the R & J aluminum-cleat bottom board. Both this and the R & J wood-cleat board are used by Zenith Foundry, West Allis, Wisconsin.

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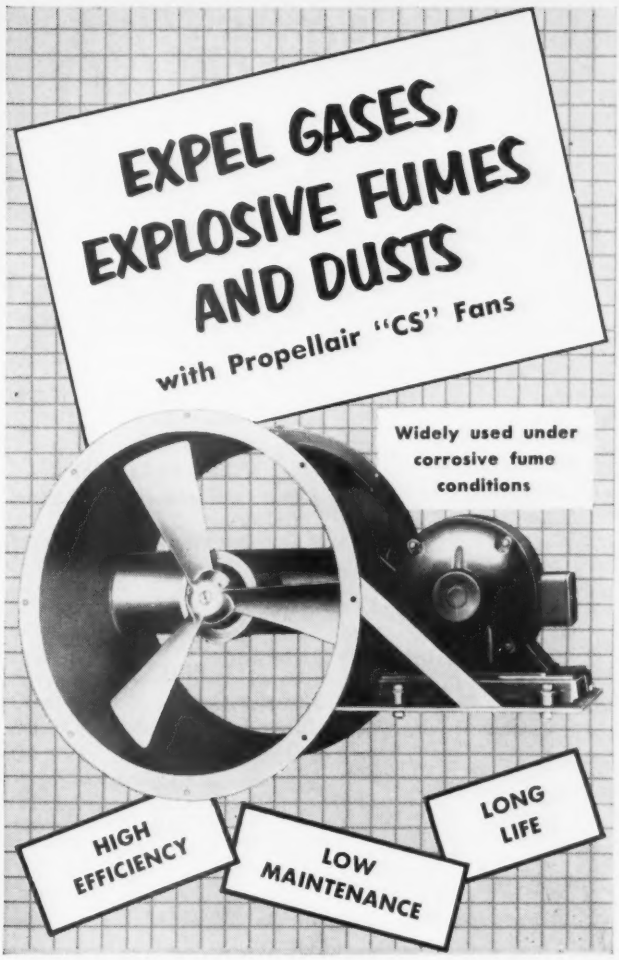

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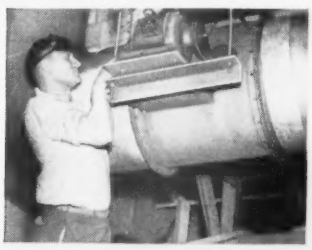

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Propellair "CS" Fans are built to fit standard duct sizes without the need of elbows. The fan drum has front and rear flanges drilled for easy mounting into duct system.

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DIVISION OF ROBBINS & MYERS • INC.

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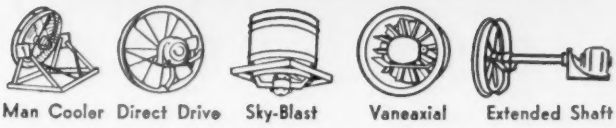

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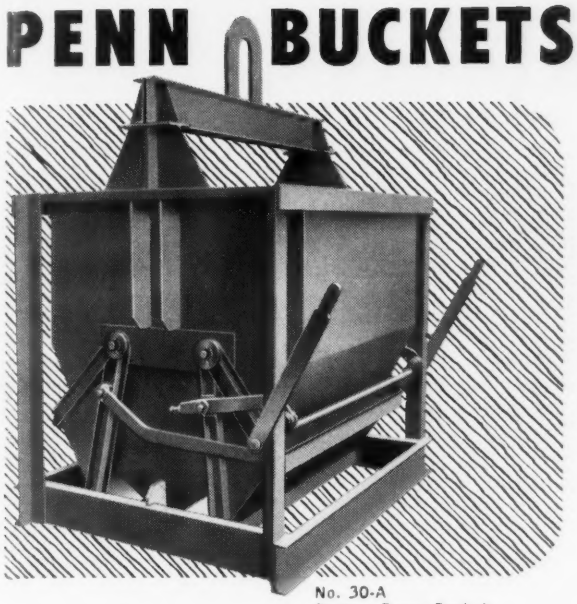

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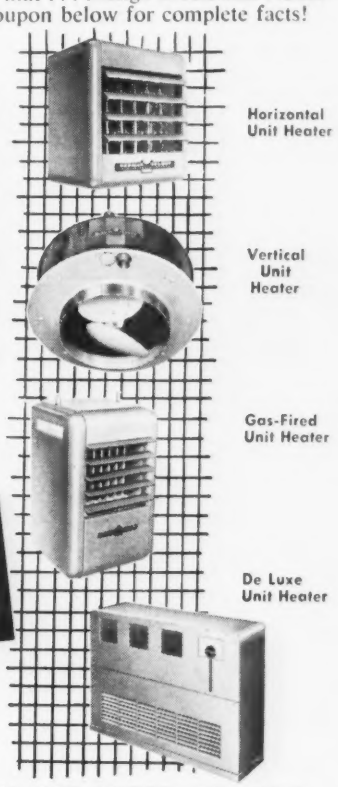

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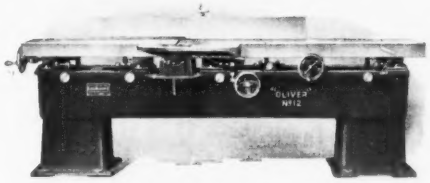
Save time! Plane draft on pattern lumber . . . make perfect glue joints with this "OLIVER"



Here's one reason why this "Oliver" Jointer is the pattern-maker's favorite: the front table tilts sideways up to 5° for planing draft on lumber. The No. 12 makes easy work of planing long and short pieces of lumber. Tables adjustable for ¾" cut. Fence adjustable from square to 45° across table. Has new rabbeting attachment. Sturdy cabinet columns eliminate vibration. Three sizes: planes 20, 24, 30 inches wide. Write for Bulletin No. 12.

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OLIVER MACHINERY COMPANY

Established 1890 **GRAND RAPIDS 2, MICHIGAN**

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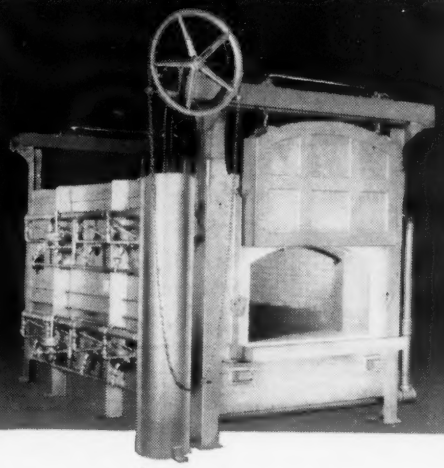

chosen by HOWARD FOUNDRY CORP. for investment casting process

For burning out lost wax and preheating molds for investment castings, Howard Foundry Corp., Chicago, chose this Eclipse gas-fired double end Oven Furnace. Check the list of quality features of Eclipse Oven Furnaces . . . a complete line for gas, oil or combination firing . . . ideal for annealing, normalizing, heat-treating and stress-relieving work. *Write for new Bulletin D-7.*

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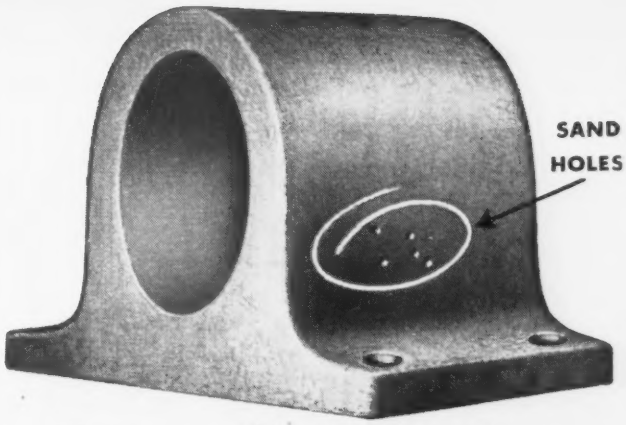
ECLIPSE FUEL ENGINEERING CO. of CANADA, Ltd. Toronto, Ont.



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Often a perfectly good casting has blow or sand holes, surface blemishes, or rough and porous areas that detract from its appearance. But there's no reason why it can't *look* as good as it really is.

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8 • Aluminum
9 • Bronze or Brass

Quality Control That Assures You of Tight, Lasting Repairs

Every lot of Smooth-On Foundry Cement is laboratory tested for setting time, hardness and color. You can be sure of tight, lasting, good looking results every time, provided the directions are followed.

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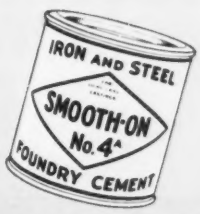

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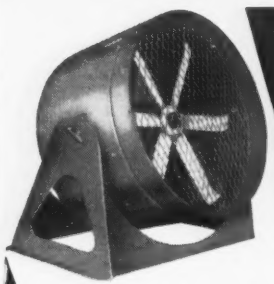

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$15.
1/16" to ¼"
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PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
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Complete with a 4½ ft. length of suction hose and sinker. For spraying molds and cores with liquids, for cleaning motors and machinery, for laying dust, for spraying hot roofing materials, and many other uses. Trigger control, guaranteed.

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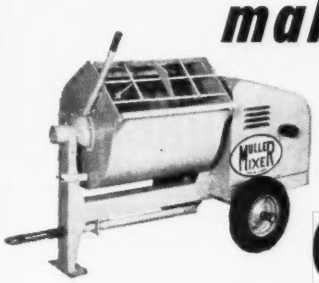
BETTER CORES *make* BETTER CASTINGS



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Water cooled molds can be maintained at either high or low temperature easily. High or limited production in very small space with unskilled labor. Completely safe for workmen. Simple, sturdy equipment. Quick changeover from one mold to another. Practically 100% metal yield of high quality, denser castings. Metal porosity eliminated.

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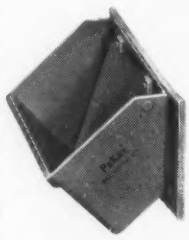
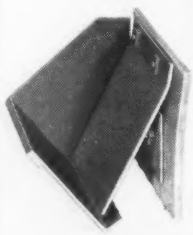
Loads *can't* stick in PEKAY *M-T-Matic* buckets, even if frozen or close-packed! The separately mounted stripper plate applies irresistible leverage to bucket contents—*empties completely* on every trip! You handle *more* material at the same or higher belt speeds—cut belt replacements too!





Separately mounted back automatically acts as stripper-plate to assure *complete* emptying. Irresistible leverage develops as bucket goes over top pulley, sweeping contents entirely clean. Buckets have standard pickup capacity. Double mounting makes belts last much longer.

the patented

PEKAY M-T-MATIC ELEVATOR CONVEYOR BUCKET

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Roller Bearing throughout
Direct Motor Drive with Speed Reducer
V Belt Motor Drive—Tight & Loose Pulley Drive

ROYERSFORD FOUNDRY & MACHINE CO.

BOX F
ROYERSFORD, PA.

EMPIRE

"THAT GOOD"

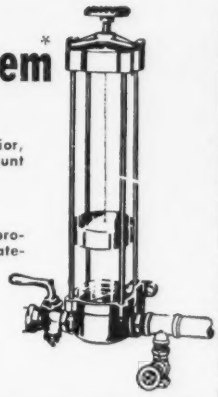
FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION

2201 First Ave., North • Birmingham 3, Ala.

Phone 3-9135

REDUCE OPERATING COSTS
with
AQUADYNE
Wet Water system*



• FOR CORE SAND MIXTURES

AQUADYNE Wet Water produces a vastly superior, smoothly blended sand mix and reduces amount of core oil needed.

• FOR MOULDING OPERATIONS

AQUADYNE Wet Water spreads, diffuses and produces a faster penetration with moulding materials—resulting in sharper, cleaner castings and fewer rejections.

• FOR SAND CONDITIONING

Sand mixing is simpler, faster and more efficient. The Aquadyne System saves water, as well as time because its unusual low surface tension gives instantaneous coverage of each grain of sand it touches.

The HYDROBLENDER

• FOR DUST CONTROL

There's nothing better than AQUADYNE.

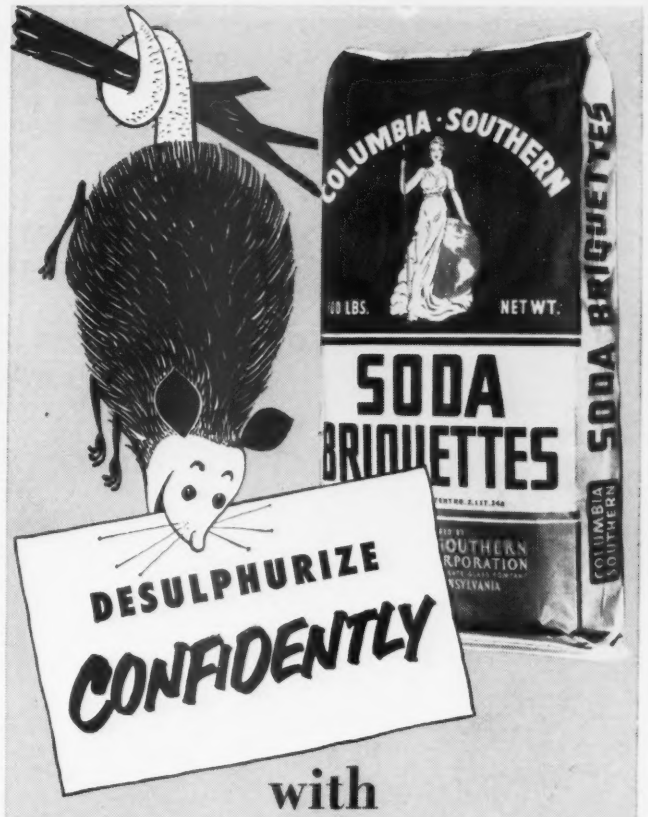
Write for our free booklets, "The Theory of Wet Water" or "Controlling Dust in Industrial Plants"

**AQUADYNE CORPORATION*

Any ordinary water supply can be hooked up to our specially designed Hydroblender. Each Aquadyne multi-phase cartridge gives 1,000 gallons of wet water for less than ½ cent a gallon.

AQUADYNE CORPORATION

441 LEXINGTON AVENUE
NEW YORK 17, N. Y.
TEL: VANDERBILT 6-2750



DESULPHURIZE
CONFIDENTLY
with
COLUMBIA-SOUTHERN
SODA BRIQUETTES

In Blast Furnace and Foundry, Columbia-Southern Soda Briquettes can always be relied upon for efficient action in the desulphurizing and physical cleansing of iron.

Blast Furnace operators can always be certain that sulphur analysis specifications will be met for Open Hearth or Bessemer Departments.

In the Foundry, Columbia-Southern Soda Briquettes improve the melting conditions and properties of iron. When added to the melt charge, the slag becomes more fluid and refining value is increased. The release of gases and impurities is speeded for quicker surfacing of spent slag.

Order your supply today by name "Columbia-Southern Soda Briquettes." Packed in 100 lb. paper bags; easy to handle and store.

COLUMBIA-SOUTHERN
CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER, PITTSBURGH 22, PENNSYLVANIA

District Offices: Boston • Charlotte • Chicago • Cincinnati • Cleveland Dallas • Houston • Minneapolis • New Orleans • New York • Philadelphia Pittsburgh • St. Louis • San Francisco

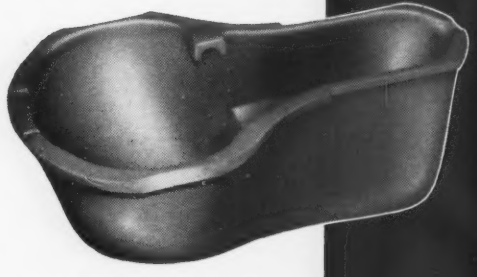
ANALYSIS OF CASTING DEFECTS

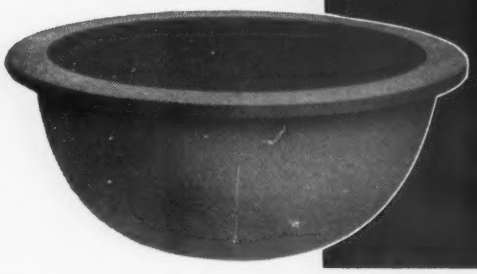
133 pages, illustrated
Price $4.25 Postpaid

To help foundrymen minimize and eliminate defective castings. Thirty-one basic casting defects are listed and described. Defects are defined simply and completely, illustrated by 101 figures collected from foundries of the United States and Canada.

THE PENTON PUBLISHING COMPANY
Book Department
1213 W. 3rd St., Cleveland 13, Ohio

THEY STAND THE HEAT!





Acme

MELTING POTS

DIE CAST POTS

INGOT MOLDS

. . . FOR MELTING NONFERROUS METALS

MADE OF SPECIAL M-HEAT RESISTING IRON • WRITE FOR SCHEDULE OF 40 SIZES

Acme FOUNDRY COMPANY

2502 22nd St. Phone: Tashmoo 5-2404 Detroit 16, Mich.

CLASSIFIED ADVERTISING

Help Wanted

GENERAL MANAGER

FOR 40-50 MAN GRAY IRON FOUNDRY IN DETROIT AREA. MUST HAVE JOB SHOP EXPERIENCE ON MACHINE TOOL CASTINGS. THIS IS AN OUTSTANDING OPPORTUNITY FOR AN AGGRESSIVE MAN WHO CAN TAKE FULL RESPONSIBILITY FOR FOUNDRY OPERATIONS. SUBMIT FULL INFORMATION .

BOX 120

FOUNDRY CLEVELAND 13, OHIO

METALLURGIST

Experienced in foundry or precision casting, plus manufacturing or research and development. Able to deal with customer technical personnel. Salary open. Thinking $10,000 start.

BOX 116

FOUNDRY CLEVELAND 13, OHIO

GENERAL SUPERINTENDENT

For malleable iron foundry. Applicant must have had experience in production shop. Metallurgical background desirable. Please state age and experience in reply. Must be familiar with malleable iron gating, molding technique, etc. Address: Box 135, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

SUPERINTENDENT

Superintendent for middle western gray iron foundry melting 100 to 120 tons per day. Age 38 to 48 preferable. Engineering training desired but must have had plenty shop experience. Permanent position in outstanding organization.

BOX 953

FOUNDRY CLEVELAND 13, OHIO

FOREMAN

Small mechanized jobbing nonferrous foundry. Southwest. Handle all phases of production, cores, molding, melting, maintenance, pattern lay-out, etc. State age, experience, salary expected.

BOX 124

FOUNDRY CLEVELAND 13, OHIO

FOREMAN WANTED

Gray iron foundry, pouring 5 tons a day. North Central Pennsylvania—salary and bonus. Send full particulars in letter.

BILLARD MACHINE & TOOL CO.
MANSFIELD, PENNSYLVANIA

METALLURGIST

For malleable casting foundry in the East, employing 225 men. To be in charge of air furnace batch type melting, sand control, and other details assisting plant manager. Write personal data, salary desired and resume of experience. Address: Box 980, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

ASSISTANT PATTERN SHOP SUPERINTENDENT

Experience in steel foundry practice desirable. In replying give complete information which will be held in strict confidence by a single executive.

BOX 133

FOUNDRY CLEVELAND 13, OHIO

SUPERINTENDENT

Well-established malleable foundry offers excellent opportunity for qualified superintendent. Knowledge of mechanized operations desired. Give age, experience and salary data.

BOX 132

FOUNDRY CLEVELAND 13, OHIO

FOUNDRY METALLURGIST

With experience in cast iron foundry practice. Prepared to travel. State age, experience, and salary required. Address: Box 923, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

CORE DEPARTMENT FOREMAN

For progressive foundry in Indiana. Must be capable of supervising core department, 25 men, for maximum efficiency and have complete knowledge of rigging equipment for blowing cores. Age required: 30 to 50 years. Excellent opportunity for right man. Write giving full details of personal background, past experience and salary expected. Address: **NOBLESVILLE CASTING COMPANY, INC., NOBLESVILLE, INDIANA.**

ALUMINUM FOUNDRY FOREMAN

Good opportunity for qualified man in a New England foundry. Must be qualified in all phases of sand cast aluminum operations in a jobbing foundry. Replies confidential. State age, list experience and give salary expected. Address: Box 119, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERVISOR

Man experienced in blowing small production cores. Must have knowledge on how to reduce operating costs. Eastern malleable iron foundry. State age, experience and salary desired. Address: Box 115, FOUNDRY, Cleveland 13, Ohio.

TECHNOLOGIST

Experienced in cast iron and foundry practice. Prepared to travel. State salary required and full qualifications. Address: Box 924, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

MALLEABLE FOUNDRYMAN

Age 32. Engineering graduate trained in leadership. Seven years' malleable experience, both non-mechanized and high production operations. Experience covers sales, cost calculations, pattern layout and gating, timestudy, personnel, purchasing, press straightening and finishing, sand control. Plenty of supervisory experience. Will relocate. Address: Box 109, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR GENERAL MANAGER

If your scrap is high and your costs are up I can help you. Have always been able to get a foundry out of trouble and make a profit for the company. That is why I can make this statement. Results guaranteed or no cost to you. Have 26 years' of practical experience in all phases of foundry operation; 45 years old. Can furnish references and any other information requested. Address: Box 134, FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER

Mature, profit-minded, dependable. Have successfully managed four companies—two taken out of the red. Available for service shortly with medium-size company requiring reliable directing ability in management, sales, finance and production. Excellent experience, foundry machine and related lines. Address: Box 999, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Graduate metallurgist with experience in gray iron, brass, steel and malleable. Now hold executive position and wish to make connection with progressive firm. Address: Box 102, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 118, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST SUPERVISOR

Degree in metallurgy plus a four-year foundry apprenticeship. Considerable experience dealing with nonferrous foundry problems and some supervision. Desire position in a technical or supervisory capacity. Age 30. Address: Box 997, FOUNDRY, Cleveland 13, Ohio.

WEIGHT ESTIMATING

Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Automatic calculator equipment. Nominal fee. Send blueprints to: **CHARLES E. ROLAND, ITASCA, ILLINOIS.**

GRAY IRON FOUNDRY EXECUTIVE

Well versed in all phases of foundry procedures available. Molding, light and heavy. Green and dry sand. Coremaking, cupola operation, gray iron metallurgy, foundry costs, customers contacts. Thirty years foundry executive experience various capacities. Presently employed. Address: Box 994, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

PERMANENT MOLD DESIGNER

Desire to associate with a progressive foundry in the Southwest or Colorado. Ten years experience in designing molds for aluminum Diesel and gas injection pumps, electric tools, appliances, etc. Supervisory experience, married, 31 years old. Address: Box 139, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Capable technical and practical executive. Well versed in all phases of the foundry, 25 years in heavy jobbing and light production work. Cost and quality minded. Best of labor relations. Age 43. Address: Box 122, FOUNDRY, Cleveland 13, Ohio.

GENERAL CORE ROOM FOREMAN OR FOUNDRY FOREMAN

Twenty-seven years' practical experience, twelve years as supervisor. Apprentice course. Experienced in blocks, heads, core sand control, core blowing, dry sand molding. Address: Box 123, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Five years experience with aluminum base casting alloys, including foundry research, production, service engineering. Excellent working knowledge of copper base and magnesium base casting alloys. Desire responsible position in production. Address: Box 137, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR GENERAL FOREMAN

Large or small castings in gray iron or nonferrous, green or dry sand. Twenty years' practical experience in all foundry details. New Jersey. Address: Box 943, FOUNDRY, Cleveland 13, Ohio.

FOREMAN

Desire permanent position. Wood patternmaker 25 years, nine years supervisory experience, patterns and gray iron foundry. Age 50. Married. Address: Box 131, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER OR TECHNICAL SUPERINTENDENT

Well qualified to supervise the Standards and Methods. Also broad experience in general foundry practice. Cost reduction and increased production can be expected. Address: Box 106, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN OR FOREMAN

Practical man with 19 years supervision in nonferrous and ferrous including all phases of foundry operations, jobbing and high production. Now employed. Prefer middle west, but not essential. Address: Box 128, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Degree in Metallurgy, seven years experience in various phases of gray iron foundry work. Midwestern location desired. Will consider any supervisory position with a promising future. Age 35. Address: Box 125, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

With wide practical experience on all kinds of light and medium castings including stove plates. Well versed in cupola operation. Prefer foundry with 25 to 35 molders. Middle aged, employed at present. Desire change to warmer climate. Others do not answer. Address: Box 111, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Thoroughly experienced in the management of gray iron production or jobbing foundries. Qualified to show you a highly efficient and low cost operation. If you are interested. Address: Box 951, FOUNDRY, Cleveland 13, Ohio.

EXECUTIVE

Experienced in all phases of foundry operation and management with thorough knowledge of each shop process, engineering, metallurgy, cost estimating and accounting, sales and industrial relations. Technical graduate. Excellent recommendations. Address: Box 100, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Superintendent or general foreman. Practical man. Twenty-seven years' experience in gray iron and nonferrous jobbing and high production shops. Now employed. Western or central New York preferred but not essential. Address: Box 909, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Top-flight man versed in controlled strengths, specification iron, either production or jobbing. Excellent labor and scrap record. University trained. Age 42. Address: Box 136, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

MANAGER OR SUPERINTENDENT

Thirty years in the foundry business; gray iron, semisteel, capable of taking complete charge of all phases of any foundry melting 15 to 20 tons per day, small to medium large castings. Very good knowledge of cupola practice, green or dry sand. Would like to locate in medium-sized town. Address: Box 130, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Malleable or gray iron, 26 years' experience in all departments, including cost and sales. Technical education. Address: Box 127, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Capable, qualified and experienced to direct all phases of foundry operations. Light and medium work, gray iron. Age 53. Technical education. Address: Box 126, FOUNDRY, Cleveland 13, Ohio.

Representatives Wanted

SALESMEN

Presently calling on aluminum, brass and steel foundries, to represent us on GRINDING WHEELS. (Commission Basis). Advise territory you cover regularly.

COMMERCIAL GRINDING WHEEL CO.
4507 W. ARMITAGE AVE.
CHICAGO 39, ILLINOIS

SALES AGENTS WANTED

SELL INVESTMENT CASTINGS IN SOUTHERN WISCONSIN AND SOUTHERN MICHIGAN AREA. COMPANY IS A LEADER IN THE FIELD. GIVE PRESENT LINES AND FULL RESUME OF EXPERIENCE.

BOX 121

FOUNDRY **CLEVELAND 13, OHIO**

SALES REPRESENTATIVES

Open territories available at Los Angeles, Cleveland, Detroit, Milwaukee, St. Louis, Birmingham and others for furnaces, combustion and control equipment line.

JOHNSTON MANUFACTURING CO.
2825 E. HENNEPIN AVENUE
MINNEAPOLIS, MINNESOTA

SALESMAN

To represent well-established company on sales of binders, fillers, flux and facings in the Cleveland area. In reply state age, experience and give references. Address: Box 964, FOUNDRY, Cleveland 13, Ohio.

Foundry Work Wanted

LOWEST COST

Top quality guaranteed. Foundry and machine shop work. Low taxes. Low wage scale. Send drawings for prompt low price quotation. Address: **AMERICAN FOUNDRY AND MACHINE SHOP, APARTADO 2610, MEXICO CITY, MEXICO.**

OPEN CAPACITY

For machinable iron castings, products manufactured. Address: **SOUTHERN BARBELL MFG. CO., P.O. BOX 156, RICHMOND, VIRGINIA.**

Opportunity

CANADIAN COMPANY

With foundry and machine shop facilities would like new lines to manufacture on royalty or other basis for canadian market. Nonferrous preferred.

BOX 114

FOUNDRY **CLEVELAND 13, OHIO**

HELP US GROW

Part ownership in a small but fast-growing corporation operating machine shop and foundry business located in the heart of the uranium development can be made available to a man with the ambition and know-how to take complete charge of the foundry. Only fully-experienced foundrymen, please. Address: Box 113, FOUNDRY, Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited
From Employers and Qualified Applicants.

For Fast Competent Assistance Contact

JOHN COPE, DIRECTOR — **37 S. WABASH, CHICAGO 3, ILL.**
IMPERIAL PERSONNEL — **FRANKLIN 2-4233**

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: **JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.**

Wanted-To-Buy

WANTED

1—Osborn #605 jolt rollover pattern draw molding machine.
2—Tabor jolt rollover pattern draw, 30" x 40" tables, portable type molding machines.
2—Osborn #444 portable jolt rollover machines.
1—Hough Payloader.
1—No. 2 Simpson Mill.
1—No. 3 Simpson Mill.
2—S.P.O. jolt squeeze pin lift molding machines. Portable type.
1—American 36 x 42 wheelabrator.

MARCH-BROWNBACK CO., INC.
POTTSTOWN, PENNSYLVANIA

WANTED

The following used, late model equipment:
1—1,000 lb. capacity, 2 or 3 phase melting furnace, complete with transformer.
2—Type P. K. heavy-duty, air jolt, air squeeze, air pin lift machines, 18-inch squeeze cylinder, 8" to 10" draw, International molding machine, or equal.
1—No. 30 Speed Muller, or equal.
1—72 ft. roll ways.
1—4' x 6' double door core oven.
Must be in excellent condition. Give full details.

BOX 117
FOUNDRY — **CLEVELAND 13, OHIO**

WANTED

STEEL SHOT & GRIT

ANY GRADES—ANY SIZES

BEMCO COMPANY
511 FREEMAN — **CINCINNATI 3, O.**

WANTED

Used induction furnace for ferrous metals. Holding capacity in range of 500 to 1000# desired.
Advise age and make and all details regarding electrical equipment.

BOX 978
FOUNDRY — **CLEVELAND 13, OHIO**

WANT TO BUY

Always in the market for surplus used foundry equipment. Contact us before selling. Interested especially in complete plants. Will go anywhere.

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, PA.
PHONE: READING 7-1321

MACHINERY WANTED

Induction Furnaces, Screens, Simpson Mixers, Riehle Compression Testing Machines, Pulverizers, Grinders, Conveyors. Address: **CONDENSER SERVICE & ENGINEERING CO., INC., HOBOKEN, NEW JERSEY, BA 7-0600.**

Wanted-To-Buy

WANTED TO BUY

One late model #3 Simpson Mixer with or without cooling hood. Must be in good running condition.

THE FOREST CITY FOUNDRIES COMPANY
2500 WEST 27th STREET
CLEVELAND 13, OHIO

WANTED TO BUY

Profitable gray iron foundry located in Middle West producing squeezer or light roll-over castings. Equipment and business only. No real estate.

BOX 977
FOUNDRY — **CLEVELAND 13, OHIO**

WANTED

ROOTS-CONNERSVILLE
POSITIVE BLOWERS

GREENE BROTHERS
511 FREEMAN — **CINCINNATI 3, O.**
PHONE: MAin 2192

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOR SALE

6700 square foot foundry, including complete sand laboratory, fire-proof pattern vault, storage sheds, excellent equipment for all type sand cast metals. Building and wheelabrator partially damaged by fire. Have good customers but destruction of machine shop by fire forces immediate sale.

WILBUR C. RICE
GREENWICH, NEW YORK
PHONE: SALEM 3528

FOR SALE

Well equipped gray iron foundry in Southern Massachusetts. Ten tons per day capacity. Good buy for working partners.

BOX 129
FOUNDRY — **CLEVELAND 13, OHIO**

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: **JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.**

FOR SALE

Completely equipped foundry and machine shop. Will sell complete with large stock of patterns for textile machinery. Located in heart of textile region in the prosperous Piedmont. Inquiries invited. Address: **CARL W. LITTLEJOHN, JR., 110½ DUNBAR ST., SPARTANBURG, S. C.**

Foundries For Sale

GRAY IRON FOUNDRY

New 51,000 square foot building on railroad spur. Everything modern. Pour 8 tons per hour. Have contracts. Located Southwestern Ohio. Heirs selling to operate other business. Showing good profits. Good labor market.

GREENE BROTHERS
511 FREEMAN
CINCINNATI 3, OHIO
PHONE MA. 2192

FOUNDRY FOR SALE

Gray iron foundry and product. $200,000 a year volume. Selling price, $45,000. Central Pennsylvania.

BOX 138
FOUNDRY — **CLEVELAND 13, OHIO**

FOR SALE

Brick and steel foundry, Southern Illinois, 160 x 320 feet, overhead monorail, water transportation available. Ideal for mechanized operation, contains equipment. Address: Box 920, FOUNDRY, Cleveland 13, Ohio.

Pattern Shop For Sale

PATTERN SHOP FOR SALE

$10,000 in Los Angeles. Growing business in growing area. Address: Box 112, FOUNDRY, Cleveland 13, Ohio.

For Sale

MOLDING MACHINES

1—Osborn #602 roll over
2—SPO #110-J Squeezers
2—SPO #213-GP Squeezer strippers
2—SPO #2114 GR Squeezer strippers
1—SPO #211-G Squeezer
1—Osborn #559-27 Stripper
1—SPO #213C Squeezer stripper
1—Osborn #559 Stripper
1—Osborn #275 JW Squeezer
1—Osborn #275 J Squeezer
1—Osborn Squeezer Stripper
1—SPO #213 UD Squeezer
1—Osborn #720 U Squeezer Stripper
1—International #G104 Roll over
1—SPO #2114G Squeezer Stripper

THE FOREST CITY FOUNDRIES COMPANY
2500 WEST 27th STREET
CLEVELAND 13, OHIO

FURNACE TRANSFORMER

Kuhlman, 191 KVA, 2200 V Prim, 90 V Sec, 1 Phase, 60 Cycles, 2125 Amps, 40% Reactance. Slightly used. Good condition.

DELL STEPHENSON & COMPANY
14456 GLASTONBURY
DETROIT 23, MICHIGAN
VERMONT 5-0697

FOR SALE

4—Type "G", 20" x 8", air jolt, air rollover International Molding Machine, also 1 machine, size 24" x 10".
1—American Foundry Equipment Co. sand cutter, Model M, 60" swath, all electric.
All machines in good condition.

BAYER FOUNDRY, INC.
SCHOFIELD, WISCONSIN

FOR SALE

Assorted sizes of 5 degree taper diamond wood slip flasks. Like new. Price reasonable. Address: **COLUMBUS BRASS & ALUMINUM CO., INC., P. O. BOX 44, COLUMBUS, INDIANA.**

For Sale

LATEST THING IN CORE OVENS

DIELECTRIC CORE OVEN — Model 1-00A—Conveyor type Mfg. 1949 by Induction Heating Corp. $14,000.00

CORE BLOWERS

#9 Osborn—for small cores 650.00
#103-4 Osborn—for medium cores .. 1250.00
#94 Osborn—for large cores 2000.00

FORK LIFT TRUCKS

15,000 lb. Hyster Fork Lift Truck ... 3500.00
6,000 lb. Clark Fork Lift Truck 1200.00

MOLDING MACHINES

Herman Jar Rollover & Pattern Draw; new in 1944; 48" x 144"—10,000# series 9500.00
Herman Jar Rollover & Pattern Draw; 80" cap. 6000# series 1500.00
Herman Jar Rollover & Pattern Draw; 30" x 36"; 1500# series; 8½" cylinder; 16" draw 1500.00
International JDP Pattern Draw; 600 lb. cap. 8" draw; on wheels 475.00
#2047-3 Osborn Jolt Rollover 275.00
#601-13 Osborn Jolt Rollover 275.00
#413-3 Osborn Jolt Rollover; 130" x 42" 5000.00
#275 J Osborn Jolt Squeezers 125.00
SPO Model 2114 G Jolt Squeeze Strippers; 1951 ..... 650.00

CLEANING EQUIPMENT

27" x 36" American Wheelabrator .. 2000.00
48" x 48" American Wheelabrator .. 6000.00
8' Pangborn Tableblast ..... OFFER

MISCELLANEOUS

Chicago Pneumatic Air Compressor—Diesel operated; 220 H.P. 10,000.00
#2 Climax Wire Straightener 250.00
Marschke Swing Frame Grinder—10 H.P. 550.00
#6 Whiting Cupola Blower 550.00
Despatch oil fired drawer type core oven; 5 drawers; Type L-4248-5 .. 1000.00
Arrow Scooter Loader, 8 cu. ft. shovel lifts 66", 3 wheels, 2 cylinder, air cooled motor 800.00
Beardsley & Piper Stationary Sandslinger; 19" head, 2 speed motor, 14' arm, 5 ton plate feeder; 6' belt unit 10,000.00

FOR THE BEST DEAL CALL

BALCHER MACHINERY COMPANY
1884 S. COMPTON ROAD
CLEVELAND HEIGHTS 18, OHIO
TELEPHONE: FAIRMOUNT 1-1186

FOR SALE

Osborn molding machine, jolt rollover pattern draw, pit type pneumatic drive, draw flask 64", model 405-1.....$1800.00
Osborn molding machine, jolt rollover, table 18" x 24", 8½" draw, No. 2047-4 350.00
Tabor molding machines, 10" squeeze... 110.00
Adams portable hand squeeze molding machines, 34" 60.00
Pangborn 1GF barrels, capacity 150 lbs. 300.00
Magnetic particle testing machines
American Wheelabrator skip bucket loaders
Hardness testers, 40,000 lb. capacity, Tinius Olsen

M. ELSTEIN
370 EAST HOUSTON ST.
NEW YORK 2, NEW YORK

FOR SALE
4 CRANES

Overhead type, like new. NORTHERN—latest type. 10 ton, 43' span; 230 volt, D.C. with E.C.M. Dynamic brake controls. Cap controlled; enclosed gearing—ball bearing throughout; tool steel wheels; replacement cost today: $35,000 each.
Selling Price: $12,500
ALSO—2000' runway—18"—50 pound wide flanged beams, 20' long:.....$100 per ton.
F.O.B. LOS ANGELES
WILL SELL ALL OR PART!!

JOSEPH BEHR & SONS, INC.
1156 SEMINARY STREET
ROCKFORD, ILL. PHONE 2-7721

YALE FORK LIFT TRUCK

000# capacity, 130" lifting height, gasoline engine. Also considerable repair parts for same. Reasonable.

THE PELTON STEEL CASTING COMPANY
MILWAUKEE 7, WISCONSIN

For Sale

FOR SALE

MOLDING MACHINES
1—Plain jolt machine, 60" x 72" table, 16" cylinder.
2—No. 275 Osborn jolt squeezers.
2—Deuscher Stationary jolt squeeze.
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers.
1—#610 Johnston & Jennings Air Jolt Rollover Draw Portable 24 x 30 table.
1—Tabor 36 x 50 table Air Jolt Rollover Draw, 3000# capacity.
1—Tabor Pedestal Core Rollover Hand Ram Rollover Draw 14 x 20 table 8" draw.
BLOWERS FOR CUPOLAS AND FURNACES
2—15 HP Spencer-Turbine 2250 CFM at 16 oz.
10—High temperature blowers 1400° F. 9000 to 15000 C.F.M.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
1—Connersville rotary blower 22 x 66 45 cu. ft. per revolution 9000 CFM.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—5 HP 20-oz. Spencer Turbine Blowers.
2—2 HP 20-oz. Spencer Turbine Blowers.
METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnaces, gas fired.
1—550# Reda Furnace, nonferrous or iron—oil or gas.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.
New 32" to 41" dia. shell cupolas made to order.
New 1000 lb. aluminum cap. tilting crucible furnaces to specifications.
MISCELLANEOUS
1—Beardsley & Piper, Model S Screenerator.
1—Stoney crane type shakeout.
1—NC-4 Royer sand separator.
1—#1 Demmler core blower.
2#16 Roto-clone units complete.
1—McLeod Small Sand Blast Barrel 24 x 24.
1—30 x 48 tumbling mill.
1—36 x 48 tumbling mill.
1—Nat'l. Eng. skip hoist.
Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

1—American Wheelabrator Tum-Blast machine, size 48" x 48", serial #A30146. Arranged for skip loading device. Model 4N428.
1—Pangborn #4-CC, serial #332590 dust collector 7'-6" x 10'-0" x 7'-6" reinforced steel casing with two 4' bottom hoppers, motor rapping device. Without blower and motor.

CRUCIBLE STEEL CASTING COMPANY
2850 S. 20th STREET
MILWAUKEE 15, WISCONSIN

FOR SALE
TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
4500	16 oz.	G.E.	400	16 oz.	Spencer
3500	40 oz.	Spencer	400	4.3 oz.	Spencer
2800	1 oz.	Spencer	340	20 oz.	A-B
2700	16 oz.	Spencer	320	12 oz.	Spencer
2500	7 oz.	Sturt.	225	16 oz.	Spencer
2000	2½ oz.	Spencer	180	15 oz.	Spencer
2000	1 oz.	Spencer	110	16 oz.	Spencer
1300	16 oz.	Spencer	9100	7" SP	Sturt.
1150	20 oz.	No.Am.	2344	2" SP	Clarage
675	16 oz.	No.Am.	1100	4½" SP	Bayley
660	20 oz.	A-B	100	7" SP	Spencer
500	10 oz.	No.Am.			

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE
DETROIT ELECTRIC FURNACE

Type AA of 1,200 lb. cold metal or 2,600 lb. hot metal capacity, complete with mechanical and electrical equipment for melting and rocking, including oil filled transformer of 11,000 v. primary and 125 v. secondary. Presently crated but available for inspection on 48 hours notice. Ideal for high test cast irons, brasses or bronzes. Price: $9,500.00. Address: **HOPE ELECTRICAL PRODUCTS CO., 338 WILSON AVENUE, NEWARK 5, N. J.**

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: **BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.**

REBUILT AND GUARANTEED EQUIPMENT

1—B & P SAND CONDITIONER, portable
1—WHEELABRATOR 27 x 36" with Skip Hoist and Dust Collector
2—CLEARFIELD MIXERS #920, 60 HP Motors
1—CLEARFIELD MIXER #610, late type AMERICAN SAND CUTTERS, various sizes
2—B & P SAND SLINGERS, 19" and 16" Heads
9—CORE OVENS, gas and electric, all types
2—HEWITT-ROBINS Apron type conveyors
2—WHITING CUPOLAS, #8 complete with G.E. Blowers
1—WHITING CUPOLA, #3½ with Skip Charger and Blower, excellent condition
1—WHITING CUPOLETTE complete with Blower, priced for quick sale
1—WHITING SKIP CHARGER with Loader and 2,000 lb KRON SCALE and BUCKET
2—SIMPLICITY SHAKEOUTS, 4' x 8'
2—SIMPSON MULLERS, #2 and #3
1—40 HP Sullivan AIR COMPRESSOR
9—SAND BELT CONVEYORS—2 ELEVATORS
2,000 FT. Foundry Type ROLLER CONVEYOR
1—DEWALT ABRASIVE CUT-OFF, 10 HP CENTRIFUGAL BLOWERS, 1 to 85 HP
1—ROTOCLONE, 24W, AMERICAN AIR FILTER ROYERS and SCREENERATORS, all sizes NUMBER OF MAGNETIC SEPARATORS
2—Bell Power Wheelbarrows—gas engines

MOLDING MACHINES

4—OSBORN 710 Jolt Strippers
1—OSBORN 444 Jolt Rollover
1—TABOR POWER ROLLOVER, 30 x 40" table, portable
1—MILWAUKEE Jolt Rollover, 30 x 40" table
3—MILWAUKEE Jolt Strippers, 32 x 38" tables
4—HERMAN ROLLOVERS: 60 x 80"; 40 x 60"; 144 x 96"
2—JOHNSTON & JENNINGS #2 Jolt Squeeze Strippers, excellent condition
6—OSBORN Rollover & Jolt Strippers, var. sizes

FURNACES

ARC MELTING FURNACES, 60# to 15 tons
3—AJAX-TAMA-WYATT 333 KW for alum. NEW!
2—FISHER TILTING, 225 and 400# crucibles
5—HAUSFELD TILTING, Various Capacities
5—MONARCH #93 Barrel Type, Tilting
1—AJAX INDUCTION, aluminum melting, 400# capacity, excellent condition
1—AJAX INDUCTION, Stainless, 600#, 960 cy
1—AJAX INDUCTION, Spark Gap Type, 50#
4—Large HEAT TREAT Furnaces

COMPLETE STOCK OF TESTING MACHINES, LAB EQUIPMENT, CORE BLOWERS, LADLES AND OVER 250 TONS OF STEEL FLASKS

Send for complete list of America's LARGEST STOCK of GUARANTEED EQUIPMENT

UNIVERSAL
MACHINERY AND EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, READING, PENNSYLVANIA

PHONE: READING 7-1321

FOUNDRY EQUIPMENT

MOLDING MACHINES

1—Herman Jolt Rollover #6000, 40" x 60"—late.
2—Herman Jolt Strippers, 48" x 54"—late.
1—Osborn 405 Rollover with Roll Out Car.
1—Osborn 332 Jolt Rollover.
1—SPO 110J Squeezers.
2—Osborn 275J Squeezers.
1—Osborn 75J Squeezer.
8—Tabor Split Pattern Squeezers.
4—Haynes Squeezers.
1—Milwaukee Squeezer.
2—Adams 12 x 38 Squeezers.
29—Osborn 2047-4 Jolt & Draw.
2—Int'l 24 x 30 Rollovers—portable.

SAND HANDLING EQUIPMENT

1—B & P 13' tractor sand slinger, heavy type.
2—#2 Simpson Mullers, open gear.
#3 Simpson Muller.
2—50" Dia. Single Wheel Simpson Mullers—Belt.
B & P Screenarator, Model M.
1—Jeffrey Sanditioner.
18", 24", 36" Belt Conveyors, 10' to 150' Centers.
Unit A Syntron Feeder Hopper, 6' x 6'.
2—Aerators, Overshot type, 9' x 2' x 4' x 3'.
Aetna Sperser System.
Simplicity Shaker, model C.
Simplicity 4 x 8 Sand Conditioner.

CRANES & HOISTS

Curtis Traveling Bridges, 15' span.
Curtis Air Hoists, 4" to 15" dia.
Electrified Monorail.
Elec. Hoists, ⅛ ton to 3 ton.
Air Hoists, to 3 ton.

BLOWERS

10,000 CFM @ 48 oz., Spencer Turbo.
6350 CFM @ 32 oz., Ingersoll Rand.
3900 CFM @ 20 oz., Whiting.
3500 CFM @ 40 oz., Spencer Turbo.
3600 CFM @ 16 oz., No. American.
2250 CFM @ 16 oz., Spencer Turbo.
Roots-Connersville Blowers 4000 to 17000 CFM.

MISCELLANEOUS

#124 Gardner 53 Horiz. Grinder.
Hough Payloader.
14' dia. Pangborn Tablast.
15,000 CFM Dust Collector.
10,000' 458 Conveyor Chain & Trolleys.
8—Combs 20" Gyratory Riddles.
1500' Hevi Duty 10" Roller Conveyor, 2½" dia.
300' Hevi Duty 10" Roller Conveyor, 3½" dia.
Ladle Preheaters, 12 unit.
Chaplets—all types.
30# & 50# Mold Weights.
2—#9 Whiting Cupolas.
Geared Ladles—to 10 tons.
2—Int'l SB11 Core Blowers.
Demmler #1 Core Blower.
Champion Core Blower, model CB400, 300 lb.
Brinell-Rockwell-Riehle Testers.
1—12 x 12 Pangborn Sand Blast Room, with Dust Collector.
2—6000# Automatic Transporters.
Baker Lift Truck, 6000# cap., 1948.
Yale Lo Lift, Redi power.
Logan Wood Slat Conveyor, motorized, 36" x 35'.
Diamond Grinder, horizontal.
15—Double End Grinders.
1—Standard Buffer & Polisher—late.
Tons of Flasks.
Perforated Steel Core Plates.
Vibrators, Osborn, 1⅝" & 2".
1—McLeod Tumbling Barrel.
Bottom Dump, Sand Buggies.

WE WILL BUY—FROM 1 PIECE UP TO ENTIRE FOUNDRY

GREENE BROTHERS

511 FREEMAN CINCINNATI 3, OHIO
PHONE: MAIN 2192.

For Sale

REBUILT & GUARANTEED EQUIPMENT

6—275 J Osborn Jolt Squeezers
14—Tabor Jolt Squeezers
25—Rapid Jolt Squeezers
4—International Jolt Squeezers
6—Milwaukee Jolt Squeezers
2—Milwaukee #15362 Jolt Pin Lift, 12" lift
1—Milwaukee 195—3 Jolt Squeeze Pin Lift
1—International PK 10 Jolt Squeeze Pin Lift
4—International Type RJ Jolt Ram Hand Turnover, Hand Draw, New
2—International Type GSR Hand Ram Air Turnover, Air Draw
3—Osborne #601 Jolt Rollover Pattern Draw
1—Osborne #341 Portable Jolt Rollover
2—International Type GR Rollover
1—Lancaster EAG 4 Muller, max. capacity 9 cu. ft., complete with skip hoist, motors and controls. Price $1850.00
7—NC 4 Royer Sand Conditioners 12 to 15 tons per hour
1—4 x 6 Simplicity Shakeout
5 ton Geared Whiting Ladle
2—4 ton Geared Whiting Ladle
3—Square Tumbling Barrels, complete with Jones Speed Reducers
2—Round Tumbling Barrels 48 x 54"
2—600 lbs. Walker Bronze Melting Furnace with Blower
Chain and Air Hoists
Gas & Electric Fork and Platform Lift Trucks
Blowers—Conveyors—Belt and Roller
1—Type G 1 36" Tannawitz Band Saw
1—Type C 10 AF Tabor Abrasive Cut Off Machine, 10 H.P. Motor

GEORGE W. CASSADY COMPANY
P.O. BOX 238
WILLIAMSPORT, PA.

ATTENTION:
PNEUMATIC TOOL USERS

200 never used tools and many hundreds of rebuilt Chippers, Rammers, Riveters, Grinders, etc. at substantial savings.

Very large stock of spare parts, Standard and O/S.

Complete repair service on your tools by refitting parts or rebuilt to original sizes with HARD CHROME.

30 years' experience handling all makes and models.

Send us your next tools as a trial. Satisfaction guaranteed or money refunded. Estimates furnished.

THE PNEUMATIC TOOL PRODUCTS CO.
1340 EAST 222nd ST.
EUCLID 17, OHIO
PHONE: KE 1-4990

FOR SALE

One Ingersoll Rand Type FS—563 Blower, direct connected and roller pedestal bearing construction. Serial #S563-J-10, 11,000 CFM, 1.5 lbs. pressure, 3500 RPM complete with 100 HP Fairbanks Morse motor, Type QZC. 3450 RPM. Used only a short time.
Several 42" dia. x 72" Type "C" Sly Tumbling Mills. Direct and V-Belt drives, with or without motors.
Both items very reasonably priced.

NEW HAVEN FOUNDRY
NEW HAVEN, MICHIGAN

FOR SALE

1—American Sand Cutter, Model M-79-60, 60" cutting wheel type, serial No. 232 with four (4) connector plugs.
1—Chicago Tramrail Jib Crane three (3) ton 18' span 16' high under the boom. Yale three (3) ton hoist 220 or 440, 3 phase, 60 cycle current.
1—Platform Truck Scale, capacity twenty (20) tons. Size of platform 20' long, 8' wide.

ALL ITEMS IN GOOD CONDITION
THE CHASE FOUNDRY & MFG. CO.
2300 PARSONS AVENUE
COLUMBUS, OHIO

FOR SALE

2—Stroman "DSB", gas fired, reverberatory aluminum furnaces, 700# capacity. NEVER USED.

ODEL DIE CASTING CORP.
9818 GRINNELL AVE.
DETROIT 13, MICHIGAN

FOR SALE

One type "AM" American Sandcutter, size 69/45 complete with two electric motors and all electrical equipment, hand-steered. A-1 condition Address: **AMERICAN FOUNDRY & MFG. CO., 1015 HERBERT STREET, ST. LOUIS 7, MISSOURI.**

For Sale

BUY—TRADE—SELL

27 x 36 Wheelabrator tumblast.....$2,2[illegible].00
48 x 42 Wheelabrator tumblast..... 3,0[illegible].00
8' Wheelabrator air table ..... 2,0[illegible].00
9' Wheelabrator table blast with smaller tables and 2 throwing wheels..... 2,5[illegible].00
8' Wheelabrator table blast without motors ..... 2,0[illegible].00
4' Wheelabrator table blast ..... 1,2[illegible].00
3½ GK2 Pangborn rocker barrel ..... 2,5[illegible].00

Also all types of Hand Cabinets, Dust Collectors and Pressure Tanks.

If interested in trading your present equipment on any of the above, Call or Write:

DIAMOND SAND BLAST, INC.
5654 W. JEFFERSON
DETROIT 9, MICHIGAN

FOR SALE

1—Tinius Olsen 100,000# Universal Compression Testing Machine
1—Magnaflux Demagnetizing Unit
Simpson Sand Mixers 18" dia. Laboratory #0, #1, #1½, #2, #3
Miscellaneous: Screens, Pulverizers, Grinders, Conveyors—all types, Tyler Rotap Screens, etc.
OUR 37TH YEAR

CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 N.Y. TEL. BA 7-0600

FOR SALE

1—27 x 36 Wheelabrator Tumblast with Loader
1—36 x 42 Wheelabrator Tumblast with Loader
1—55KD American bag type Dust Collector, 2750 CFM
1—#220CK Pangborn Cyclone and cloth Dust Collector, 2000 CFM
1—404 Clearfield Muller

PIONEER FOUNDRY & MFG. CO., INC.
GILBERTVILLE, MASS.

FOR SALE

1—#2 Demmler core blower, complete with vertical and horizontal core box clamps 7½" x 14" opening at bottom of sand magazine.
1—International type SB-11 core blower with horizontal draw and set of vertical core box clamps.

THE ALLOY CAST STEEL CO.
MARION, OHIO

FOR SALE

3—Fisher tilting type BB1-400 oil crucible melting furnaces. For nonferrous melting.
2—Fisher tilting type BB1-200 oil crucible melting furnaces. For nonferrous melting.

FRANK L. PHILLIPS COMPANY, INC.
80-82 FREDERICK ST. BINGHAMTON, N. Y.

FOR SALE

#2 American Multi Table, serial No. A-84721. Five 37" diameter tables. New September 25, 1951. In excellent condition. $950.00 in new parts. Our price for machine complete with electric motors and parts, loaded on railroad car $6,000.00. This machine can be seen in operation at our plant. We are disposing of this equipment as we have discontinued the manufacture of the parts for which this machine was purchased. Address: **NOBLESVILLE CASTING CO., INC., NOBLESVILLE, INDIANA, PHONE 74.**

FOR SALE

Pangborn Rotoblast Cleaning Machine, type 14LG5, serial #461, 14' diameter table with five auxiliary tables 5' diameter (removable), three rotoblast units, dust collector Pangborn type CH2, screen section, fan house, and KO7 exhauster (new in 1949). Motors and control for 440 volts, 3 phase, 60 cycles AC. Address: **THE BROWN-FAYRO COMPANY, 940 ASH STREET, JOHNSTOWN, PENNSYLVANIA.**

FOR SALE

One #6½ Roots-Connersville Blower with 77" impeller length previously used to furnish air to cupola, 66" inside diameter. Address: **MR. WAYNE E. WEST, GEO. D. ROPER CORPORATION, ROCKFORD, ILLINOIS.**

FOR SALE

Model "M" sandcutter by American Wheelabrator, in good condition. Six years old. Address: **BOX 71, JOHNSON CITY, NEW YORK.**

WE'RE MOVING—SAVE—YOU BENEFIT

MOLDING MACHINES

5—**S P O** No. 110J Portable Jolt Squeeze Machines, 1952 machines.
2—**S P O** No. 506 Jolt Rollover Pattern Draw, 600 lbs. Cap., 10" Draw, 24" x 25" Table. Stationary, and portable models.
6—**OSBORN** No. 275J, Jolt Squeeze Machines, portable and stationary models.
1—**OSBORN** No. 710HJ Jolt, Squeeze, Pin Lift. Stationary.
3—**OSBORN** No. 559 HD Jolt Strippers, stationary, Table 25" x 30", Jolt 1200 lbs. 1—Portable.
1—**OSBORN** #405-79 Jolt Rollover Pattern Draw Molding Machine 40" x 72" Table Size, Capacity 3500 lbs.
6—**OSBORN** #212 PJ Jolt Squeezers, 17" x 26" table, 12" squeeze cylinder.
3—**OSBORN** Model 601, Jolt, Rollover, Pattern Draw, 600 lbs. cap. Flask 30".
1—**OSBORN** No. 333 H Jolt, Squeeze, Power Rollover, Pattern Draw, 2000 lbs., Jolt, 22" x 44" Table Jolt Cyl. 12", Draw 22".
2—**OSBORN** No. 142 Jolt, Rollover, Foot Draw, 14½" x 24" Table Draw 8", 350 lbs. capacity.
1—**HERMAN PNEUMATIC** 40" x 60", 15" Solid Cylinder Jarring Molding Machine, Heavy duty Bumper type.
1—**JOHNSTON & JENNINGS** #401-C, Portable, Jolt Squeezer.
1—**JOHNSTON & JENNINGS** #681-C, Portable Jolt Stripper, 24" x 30" Table.
1—**JOHNSTON & JENNINGS** #918-B, 44" x 54" Table, 3000 lbs capacity, 20" Draw.
1—**JOHNSTON & JENNINGS** Model 1216S Stationary Jolt Pin Lift, table size 36" x 54", Draw 16". Capacity 3000 lbs.
1—**JOHNSTON & JENNINGS** Air Jolt Machine, 20" x 30" Table 6" cylinder.
1—**TABOR** Jolt Rollover and Pattern Draw, Draw 10", 600 lbs. Capacity, 22" x 42" Table. Shockless Jar, Portable.
1—**TABOR** Jolt Rollover Pattern Draw, 30" x 40" Table, Draw 12", Capacity 1500 lbs, stationary, w/air clamps.
1—**INTERNATIONAL** Model PKL, Jolt Squeeze, Air Pin Lift Machines. 18" x 24" Table, Lift 5½", Squeeze Cyl., 12".
1—**INTERNATIONAL** Model MJ, 16" x 4" Draw, Power Jolt Hand Rollover.
5—**INTERNATIONAL** Type "R" Hand Ram, Hand Turnover, Foot Draw.
2—**INTERNATIONAL** Type "HJ" Jolt Ram, Hand Turnover, Foot or Hand Lever Draw Machines. Various sizes.
2—**INTERNATIONAL** Type RES, Size 15" x 8", Jolt Squeeze, Rollover, Draw Machines. Table size 18" x 34".
4—**INTERNATIONAL** Type G, Air Jolt, Air Turnover Foot Draw Machines. Sizes 20" x 8"—24" x 8"—30" x 8"—24" x 10".
2—**CHAMPION** JS-10-P, Jolt Squeezer, Portable, Serial No. 5770, Table size 18" x 26". One like new, still crated, 2—Heads.
1—**CHAMPION** Model No. JM 16, Serial No. 5092, Power Jolt, Hand Turnover, Foot Draw Machine, 13" x 17" table.
2—**DAVENPORT** Model SA-34, Jolt Rollover and Pattern Draw 2500 lb. Jolt Capacity, 15" Draw, 34" x 48" table.
1—**DAVENPORT** Model 28, Jolt Rollover, and Pattern Draw, 1500 lb. Jolt Capacity, 12" Draw, 30" x 40" table.

MULLERS

1—**SIMPSON** No. 1½ Sand Muller, Unit Drive, 750 lb. batch. Late type with Skip Hoist.
1—**SIMPSON** No. 2 Sand Muller. Complete with motor and drive. Open Gear type.
1—**SIMPSON** No. 3 Sand Muller, Open Gear Type with Motor Drive.
2—**BEARDSLEY & PIPER** No. 60 Speed Mullers, 10 cu. ft. w/motor and drive.
1—**CLEARFIELD** #404 Late Type. Sand Muller, Motor 220 V.

SAND PREPARATORS

4—**BEARDSLEY & PIPER Model "S"** Screenerator, Pneumatic Tires.
1—**BEARDSLEY & PIPER** Model "L" Screenerator, on pneumatic tires.
1—**BEARDSLEY & PIPER** Sand Conditioner, complete with magnetic separator, 10 H.P. totally enclosed motor, overhead hopper, 90 cubic ft. & aerator. Serial Number SC-73, 1946 machine.
1—**ROYER** Model NB-2 Sand Conditioner, portable, 7 to 9½ tons.
1—**ROYER** Model C-2 Sand Conditioner, portable, 25 to 30 tons per hour.
1—**JEFFREY** Type "P" Sand Conditioner, Class B Mixer, Portable, Serial No. 377.
1—**AMERICAN** Sand Cutter, Model AM, Size 69 x 45.
1—**AMERICAN** Sand Cutter Model 79 x 60.
1—**ROYER** Shakeout and portable sand conditioning unit.

CORE OVENS

1—**COLEMAN** Core Oven, gas fired, 2 doors, 6' high, 5' wide, 4' deep.
2—**DISPATCH**, Gas Fired, Drawer Type Core Ovens. Drawers 46" wide, 59" deep, 9" high. Complete with Rail Supports and Controls. These machines are in excellent condition and were new in 1944.

CORE BLOWERS

1—**OSBORN** No. 91 Core Blower, Serial 10050.
2—**OSBORN** No. 92 Core Blowers, Serial No. 9703A and 8692-C, Air Clamps.
1—**DEMMLER**, No. 1-E Core Blower, Serial No. 3287. Equipped with Air Clamps, 1950 Machine.
1—**DEMMLER** No. 2 Core Blower, Air Clamps.
2—**REDFORD** No. 1, Cartridge Bench Type.
1—**DEMMLER** #55 Core Blower.

GRINDING EQUIPMENT

1—**FOX** Stand Grinder #5, single wheel, size 24" x 2", 10 H.P. 220/440 V.
1—**HAMMOND** Model WR-1 Double End Snagging Grinder, 7½ H.P., 220/440/3/60.
2—**HAMMOND** Model WH-10 Double End Grinders with (2) 7½ H.P. 220/440 3 phase, 60 cycle, wheel size 20" x 2" x 2".
2—**U. S. ELECTRIC** Double End Snag Grinders, 20" Wheel, 5 H.P. Motor.
1—**QUEEN CITY** Model 100 Double End Disc Grinder with 10 H.P. 220/440 Volt Motor size 20" x 2" x 2". Very Late.
1—3 H.P. Double End Grinder.
1—Safety Portable Swing Grinder 24" x 3", 15 H.P. Motor.

SAND BLASTING EQUIPMENT

1—**AMERICAN WHEELABRATOR** Tumblast, 36 x 42, with Skip Hoist & Shot Return. Serial No. A-37913.
1—**AMERICAN WHEELABRATOR** Multi-Table Blast Machine, 8-27" Tables, with Shot Return and Dust Collector. Serial No. A-44791, Model BM 66900.
1—**PANGBORN** Room Blast 10' x 12' x 12', complete with Tank, Elevator, Dust Collector and Safety Equipment.
1—**NEW HAVEN** Air Blast Barrel 48" x 42". with Motor and Drive, 1942 unit.
2—**WHITING** Tumbling Barrels 30" x 60", plate 1", complete with 5 HP gear head motor, drive, and starter, 1952 units, used 3 months.
1—**VAPOR** Blast 30" x 30" Model 3030 Type B-20, liquid honing machine, 1947 machine.

MELTING FURNACES

5—**FISHER**, #400 Crucible, mechanical tilting, with motors and blowers, new crucible, and bricking, gas or oil fired. New in 1949.
3—**FISHER** Model MNP Tilting Furnaces, size 2400, complete with New Pot, blowers, and electrical tilting mechanism.
6—**BELLVIEW** Tilting Furnaces 550 lbs. capacity, with pots. 2-H.P. motor and blower. Gas or oil burners.
1—**REDA** 550 lb. Hydraulic Tilt, Gas or Oil Fired. 1952 Unit.
1—**STROMAN** Tilting Furnace, #325 crucible, gas fired, 4 burners, 2 H.P. motor and blower.
1—**STROMAN** #600, Model "U" Tilting Furnace, 3 H.P. motor and blower, gas fired, with extra shell. New in 1949.
1—**YORK WALKER** #28 Tilt Furnace, 300-400 Crucible, complete with new bricking, motor and blower.
4—500 lbs. capacity Holding Furnaces, newly bricked. With burners, motors and blowers.
3—Stationary Pit Type Furnaces, 125 lb. Crucible. With burners, motors and blowers.

LADLES AND POURING DEVICES

3—**MODERN** Pouring Device, Model "F", Ladle Hoists, with 17" Taper Covered Ladles, 500 lbs. capacity with Hand Tilting Devices.
1—**WHITING** 1-ton Gear Enclosed Tilting, 27" diameter, Nose Tilting.
1—**WHITING** Ladle, 2 tons, tilting, enclosed gearings.
2—**WHITING** 4 Ton, Tilt, Ladles, Gear, Enclosed.
2—**WHITING** 5 Ton, Tilt, Ladles, Gear Enclosed.
1—**WHITING** 8½ Ton Tilting Ladle.
1—**WHITING** 10 Ton Tilting Ladle.

HEAT TREAT FURNACES

1—**YOUNG** (3) Compartment Pull Drawer Oven, for Magnesium, each compartment 6'6" wide x 5'9" deep x 7' high inside (3) Drawers to each compartment. Electric heating for temperature of 800°. For Heat Treating, Drawing or Stress Relieving.

CONVEYORS—Apron - Roller - Belt

1—**FARQUHAR** 167' x 24" Trough Conveyor, 375' of 5 ply belting. 15 H.P. Motor and Drive. New in 1952.
1—**JEFFREY** 24" wide 10'3" centers, Trough Conveyor, with Stearns Magnetic Pulley, Motor and Reducer.
1—**GODFREY** 18" x 19' Under Car Unloader, with 3 H.P. Motor, Steel Belt.
1—18" x 24' Apron Conveyor, Steel Link Belt, complete with motor and drive.
1—24" x 20' Apron Conveyor, Steel Link Belt.—Less motor and drive.
500'—**MATHEWS** Roller Conveyor, Above Rail 20" wide, 2½" Rollers, on 4" Centers.
300'—**MATHEWS** Roller Conveyor, Above Rail 24" wide, 2¾" Rollers, 4" Centers.
200'—Heavy Duty Roller Conveyor 30" wide, 3" Rollers on 6" Centers, ⅞" shaft, 4" channel, Roller above rail.
100'—Roller Conveyor 14" wide, 2" Rollers, above rail.
1—**FARQUHAR** 18" x 40' Model 343 Portable Trough Conveyor with 5 H.P. motor, starter, 3 sided feed hopper. 1952 Unit.

BUCKET ELEVATOR

1—**JEFFREY**, 106' Belt 13" wide, 50' center to center of Drive Pulleys, 106—12" x 8" x 11¾" continuous type buckets, with Jones Reducer.

AIR HOISTS—ELECTRIC HOISTS

2—**INGERSOLL RAND**, Size D, 4000 lbs. Air Hoists.
2—**INGERSOLL RAND**, Size B 1000 lbs. Late type with Trolleys.
1—**LITTLE GIANT**, Model A, 1000# cap.
4—**THOR PNEUMATIC**, 1000 lbs. capacity, low head room.
1—**SHEPPARD** 5-Ton D.C. Hoist, 6 H.P. Motor, 230 V.
1—Electro-Lift, 3000 lbs cap. 220/440 low head room cable hoist.

SHAKEOUTS

1—**SIMPLICITY** Shakeouts, 3' x 3', Serial #33—SOS—106, Model S, 1000# cap.
1—**SIMPLICITY** Shakeout, 4' x 6', Model D, 16,000 lbs. capacity, 10 H.P. Motor.
1—**SIMPLICITY** Shakeout, 5' x 7', Serial No. 57—SOBG—185, Model BG, 5000 lbs. capacity.
1—**SIMPLICITY** Shakeout, 4' x 6', Serial No. 46—SOB—145, Model B.
2—**SIMPLICITY** Shakeouts, 4' x 8', Serial No. 48—SODE 104, Model DE, 16,000 lbs. capacity.

BLOWERS

1—**BUFFALO FORGE** No. 7-E Blower, 25 H.P., 3600 rpm, 220/440 volts. 28" wheel, 32 oz., 1600 cfm.
5—Assorted Blowers for Furnaces, 2-3-5 H.P., 16 oz.
1—**STURDEVANT** #9 Cupola Blower, 75 H.P. 220/440 V. 3 Ph., 60 Cycle.
1—**NORTH AMERICAN** 7½ H.P., 220 V., 1900 CFM, 8 oz.

SAND SLINGER

1—**B & P**, model DB, stationary type, 16" head, 4" tip, first arm 10'3", 4' ramming unit. Motor-dual, 10-15 HP, 220-440 V. 60 cy.

MISCELLANEOUS

1—**INGERSOLL RAND** Air Winch. Size MHO.
1—**SCHMEIG** Spark Arrestor.
1—**LINK-BELT** Car Puller.
1—**EPC** 55" Crane Magnet.
1—**PANGBORN** Exhauster No. KW2.
1—**PANGBORN** Exhauster No. 10KX.
1—**PANGBORN** Exhauster Size #7.
1—**PANGBORN** Exhauster Size C.
1—**ELECTRO-MAGNETIC** Pulley 24" x 24".
3—Electric Riddles, 21" diameter, ¼ H.P. Motor, 110 volts.
1—**CLIMAX** Wire Straightener No. 2.
2—**SYNTRON** Vibra Flow Feeds, Type F 210, Style 153S.
3—**LEEDS & NORTHRUP** Model "S" Micromax.
1—Cupola Lighter, Tank and Torch.
1—**HOWE**, Weightograph 6000 lbs. capacity 4' x 5' Platform.
1—**DIETERT** #540 Comb. Lab Sifter and Sieves.

AAA MACHINERY & EQUIPMENT CO.

15539 SARANAC ROAD *Members of American Foundrymen's Society* **CLEVELAND 10, OHIO**

ALL EQUIPMENT SOLD WITH A FULL MONEY BACK GUARANTEE

FOR SALE

AIR COMPRESSORS

1—150 H.P. 875 CFM Ingersoll-Rand two-stage air compressor, 220V. 3 ph. 60 cy. with air receiving tank.
1—40 H.P. 200 CFM Pennsylvania single stage air compressor, 220/440/3/60 with air receiving tank.

AIR HOISTS

2—Ingersoll-Rand 6000 lb. cap., installed on 4'6" x 8' frame with trolley and air motor for horizontal travel.
2—Ingersoll-Rand, 4000 lbs. capacity.
1—Ingersoll-Rand, 2000 lbs. capacity.
1—Ingersoll-Rand, 1000 lbs. capacity.
12—Pendant Air Hoists.

CONVEYORS

Belt Conveyor—Linkbelt 24" x 100' troughing.
Steel Apron Conveyor 42" x 10'0" with drive and motor.
Roller Conveyor—Mathews—8", 14", 20", 24", 30", 36", above rail.
1—Link-Belt Roller Type Power Mold Conveyor, 27'0" x 70'6" centers, 35 cars 38" x 72", to operate in a rectangular path at speed of approximately 45 ft. per minute, complete with structural steel supporting frame work, necessary take-ups, idler corners and driving mechanism with speed reducer, motor and controls.
1—Pigmold Conveyor, 64' sprocket centers, Link-Belt, complete with drive 220/440/-3/60.

CORE BLOWERS

DEMLER
1—#1—weight of core up to 10 lbs.
1—#2K—weight of core up to 25 lbs.
1—#3E—weight of core up to 35 lbs.
OSBORN
10—#92—weight of core up to 35 lbs.
1—#194-1—weight of core up to 100 lbs.
REDFORD
3—Bench Cartridge Type for small cores.

CORE - OVENS

1—2 Door Coleman, two rack type, gas and oil firing combination recirculating. All controls. Overall 14'10" x 15'8".
1—2 Door Despatch, recirculating, gas and oil fired. Doors 6'8" x 6'8". 16'0" x 16'0" overall. All controls.

CRANES

1—3 ton—3 motor Bedford bridge crane, 40' span, double built-up steel bridge with catwalk man cab, drum controls, roller collectors, 30 H.P. hoist motor, 10 H.P. travel motor, 3 H.P. Trolley motor, 220/440/3/60.
1—30' hand traveling bridge crane.
3—12' hand traveling bridge crane.
1—20' hand traveling bridge crane.
6—Louden Monorail systems.
2—3 ton Shepard Cupola charging cranes, DC 550V., cab operated, complete with monorail.

FURNACES AND BLOWERS

FURNACES:
STROMAN
2—220/225 NP hydraulic tilt, with blowers.
1—#14 Non-tilt.
CAMPBELL-HAUSFELD
1—500# Hand Tilting, Nose Pour.
1—#40 Crucible Non-tilt.
FISHER
2000# MNP elec. tilting, with blower.
HEAT TREATING:
LINDBERG
2—48" x 60" 1400° 90 KW 230V. w/5 H.P. Blower.
G. E.
1—30" x 42" 1800° 37 KW 220V. 1 ph. 168 Amps.
FURNACE BLOWERS:
2—3 H.P. 220/440/3/60, 300 CMF 16 oz. pressure.
1—2 H.P. 220/440/3/60, 260 CMF 16 oz. pressure.
CUPOLA BLOWERS:
1—Spencer Turbine, 50 H.P., 220/440/3/60, 6750 CFM, 16 oz. pressure.
1—North American, 20 H.P., 220/440/3/60, 1950 CFM, 24 oz. pressure.
1—Piqua Size 5½, with 30 H.P. 220/3/60 motor.
EXHAUSTERS:
1—Sturtevant Silentvane, Size 75, 5 H.P. 220/440/3/60.
1—Ingersoll-Rand, 2075 CFM, 15 H.P., 220/440/3/60.
4—110V. fans, 24" dia.

GRINDING EQUIPMENT

2—Fin Cleaning Machines for cylinder heads—Ireland.
1—#230 Gardner double end disc grinder, 30" wheels, V-belt driven.
1—#6 Cheesly disc grinder dir. connected 18" wheel.
1—3 H.P. double end grinder, flat belt driven 220/440/3/60.
1—10 H.P. Black & Decker direct drive double end grinder, 20" x 3" wheels, 220/440/3/60.
2—7½ H.P. #76 Safety Emery Wheel Co. dir. conn. double end grinders, 18" x 3" wheels, 220/3/60.
2—5 H.P. Safety Emery Wheel Co. belt driven double end grinders 18" x 3" wheel, 220V. 3/60.
1—7½ H.P. Universal Swing Grinder, 220/-440/3/60.

LADLES

WHITING AND MODERN
24" and 27" diameter, 1500 to 2000 lbs. cap. Fully enclosed gear box for hand tilting. 5 ton and 10 ton ladles.

MOLDING MACHINES

JOLT ROLLOVER AND PATTERN DRAW:
DAVENPORT
2—SA-28, 1500 lbs. jolt, 12" draw, 30" x 40" table, 1 w/air clamps.
2—SA-34, 2500 lbs. jolt, 15" draw, 34" x 48" table.
HERMAN
2—Pit-type, 6000 lbs. jolt, 42" x 60" table.
1—Pit-type, 9400 lbs. jolt, 40" x 84" table.
1—Pit-type, 10,000 lbs. jolt, 72" x 12'0" table.
JOHNSTON & JENNINGS
1—Model 815, 1200 lbs. jolt, 15" draw, 30" x 40" table.
OSBORN
7—Model 601, 900 lbs. jolt, 10" draw, 24" x 30" flask max.
11—Model 2047, 8" draw, 21¼" x 22¼" core box.
2—Model 405-95, 3500 lbs. jolt, 26" draw, 40" x 60" table.
TABOR
2—22" x 32" Table, 600 lbs. jolt, 10" draw, with air clamps.
1—30" x 40" Table, 1000 lbs. jolt, 12" draw, with air clamps.
JOLT SQUEEZE PIN LIFT:
INTERNATIONAL
1—LJSK Hand Lever Lift, 18" x 24" Table, 12" squeeze cyl.
MILWAUKEE
2—196 Roll-on, Roll-off, 3000# jolt, 19" squeeze cyl., 20" x 30" table, 10" draw.
OSBORN
4—S14-P Stationary, 8" draw, 700# jolt, 14" squeeze cyl.
SPO
2—2114G Portable, 4" draw, 600# jolt, 11" squeeze cyl., 20" x 27" table.
JOLT SQUEEZER:
INTERNATIONAL
JOHNSTON & JENNINGS
MODERN
OSBORN—275-J, 210-PJ
SPO—110J, 110PJ
TABOR
JOLT STRIPPER:
DAVENPORT
1—34AJS, 2500# jolt, 12" draw, 36" x 46" table.
INTERNATIONAL
1—JFL, Foot Lever Lift, 3" draw, 600# jolt.
OSBORN
1—559, 1200# jolt, 6" draw, 25" x 30" table.
1—3' x 16' table for long jobs.
ROCKOVER AND DRAW:
INTERNATIONAL
3—"R" hand ram, hand rollover.
MODERN
2—Air jolt, hand rollover.
OSBORN
1—147-1, 20" x 60" core box max.
1—146, 24" x 32" core box max.

SCALES

1—Car scale for cupola charges—Atlas Car & Mfg. Co.
1—6500 lbs. Toledo Floor Scale—Dial. 5' x 7' platform.

SAND SLINGERS

3—16" head Beardsley-Piper Stationary, 1200 RPM, 10 H.P., 220/440/3/60.

SHAKE-OUTS

ROBBINS
1—4' x 6', 8000 lbs. capacity, "Floatex."
1—4' x 10", 12,000 lbs. capacity with 7½ H.P., 220/440/3/60 motor.
SIMPLICITY
1—4' x 6' Model D, 16,000 lbs. capacity, 10 H.P., 220/440/3/60.
1—4' x 6' Model SOB, 5000 lbs. capacity.

SAND MULLERS

SIMPSON
1—#2 Model H, Style E, 14 cu. ft per batch, 6' dia. pan.
1—#3 Model H, Style E, 30 cu. ft. per bath, 8' dia. pan.
BEARDSLEY-PIPER
2—#70, 29 to 58 tons per hr., 18 cu. ft. per batch.
LINK-BELT
1—Paddle type, 20" x 72".
1—Pugmill, 42" x 96".

SAND PREPARATORS

2—American Sand Cutters, Type AA, 4'8" and 5'2".
1—Link-Belt Aerator with drive, complete.
4—Royer Sand Conditioners, NB-4, C-2, D-23.

SAND BLAST, TUMBLING AND DUST COLLECTING

1—Sly Sandblast Room, 8' x 10', with elevator, sandblast pressure tank, steel air tank, hand operated rear man door, revolving floor plate with divider.
1—Ruemelin air blast cleaning cabinet.
8—Cleaning cabinets for magnesium castings w/exhausters.
1—West Dust Collecting System, Uniwash Recirculating water type, Newcomb-Detroit, 5000 CFM complete.
1—Size 55 American Dustube collector, Type KD, 9'6" x 10'6", x 8'6", 1175 sq. ft. cloth area, 3300 CFM complete.
1—Tumbling Barrel 18" x 36"—¼" riveted steel, ring gear, 8" dia. pinion gears, with 1 Boston right angle speed reducer and 1 H.P. 220/440/3/60 motor, 1750 RPM motor.
1—Tumbling Barrel 48" x 75"—¾" steel plate, spidered end plates, hinged loading door, and ring gear and spur gear drive, steel end standards.

MISCELLANEOUS FOUNDRY EQUIPMENT

4—20" Combs Gyratory Sand Riddles—Electric.
1—Lot of steel flasks—ask for list.
1—#3½ Modern Cupola.
6—Chain hoists, ½ ton, 1 ton, 2 ton.
1—Link-Belt Core Breaker Drum, 6' x 10'.
1—Revolving Core Conveyor Table.
2—#3 Jeffrey Electric Vibrators.
4—#4 Jeffrey Electric Vibrators.
1—Blaw Knox Clamshell Bucket, Size 30S-F.
2—1000 GPM Centrifugal Pumps, Ingersoll-Rand, 52" head, 5" suction, 4" discharge, dir. conn. to 30 H.P. motor 220/440/3/60.
1—Impregnating Installation, fully equipped.

WHILE AT THE FOUNDRY SHOW IN CLEVELAND, STOP AT OUR BOOTH NO. 1716, FOR OUR LATEST LISTINGS AND TRANSPORTATION TO OUR DISPLAY ROOMS AND WAREHOUSE. SEE THE LARGEST STOCK OF FOUNDRY EQUIPMENT IN THE MIDWEST.

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Electric Melting Furnaces

A large company discontinued its steel foundry—we bought the furnaces.

ELECTROMELT TYPE C Side Charge, 2 ton per hour rated capacity. 7000# to 8000# usual heats. Can handle 16,000# heats. Late type transformers. 1200 KVA, 13,200 volt primary. Complete with all controls.

DETROIT ELECTRIC, 1200# capacity, 13,200 primary voltage. Kuhlman transformers. Complete with controls.

DETROIT ELECTRIC 350#, Type LFA with Kuhlman transformers and oil circuit breaker.

The two larger units may be seen in place.

LECTROMELT 500# Type T, Side Charge. G.E. circuit breaker. Moore controls and Pittsburgh 300-375 KVA 2300 volt primary transformer.

DETROIT ELECTRIC with 350# and 100# tapered shells, 2300 V Kuhlman Transformer. Complete with panelboard and bus bars.

2—DETROIT 10# Electric Laboratory size melting furnaces, 100 amp, 250 volt.

ACME EQUIPMENT CO., INC., 126 South Clinton Street, Chicago 6, Illinois, Phone: Andover 3-3430.

FOR SALE

AIR COMPRESSOR

Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 HP, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.

BLOWERS

Spencer Turbo Blower, 2250 CFM at 16 oz. 15 HP 3/60/220 totally enclosed motor. New 1947.

Ingersoll Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220 V. G.E. Induction Motor.

Buffalo 7E Direct Connected Blower, 50 HP Westinghouse motor, 3/60/220-440 V, 3535 rpm, 28" wheel, 3500-4000 CFM at 32 oz. Flanged outlet.

Spencer Turbo Blower. New 1949. 3500 cfm, 28 oz. with 40 HP 220-440 motor and Foxboro controls.

CONVERTER

100 KW Rotary Westinghouse 220 V 60 cycle primary 250 V DC, complete with controller and panel.

CORE BLOWER

Demmler #35.

1—Redford Core Blower, bench type.

CRANES

5 Ton P & H Overhead Elec. Traveling Crane, 30'6" span, 15' lift (can be increased) 3 motor, 220 V A.C. New 1946.

5 Ton P & H Overhead Electric 20'5" span, electric hoist, hand travel both ways, P/B control 440 V A.C.

10 Ton Northern Overhead Elec. Traveling Crane, double girder, fish belly, 3 motors, 230 V D.C., 54'7½" wide C to C of wheels can be cut down to fit smaller size.

Link Belt Model YC9A Boom type Cargo Crane. 20' max. boom, 7½ ton cap. at 5½'. Gasoline motor driven, hard rubber tires. Excellent condition.

CRUSHERS—PULVERIZERS

2—Stedman 15" x 12" Type A. One with 10 HP 220-440 V motor. One without motor.

7—Prater Blue Streak Pulverizers, 30 HP motor.

CUPOLA CHARGER HOIST

Cupola Charger Hoist with 5 HP Star 220-440 V motor.

ELECTRIC FURNACES

2—Bailey (Electric Furnace Co.) 75 KW Electric Arcy type side electrode tilting furnaces and transformers.

FIRE EXTINGUISHERS

St. Regis Model 181 Dry Powder for magnesium fires.

Buffalo 50 gal. soda-acid cart type.

FORK LIFTS

Baker 6000# Gasoline Fork Lift Trucks, KMH60, 120" lift, 88" collapsed height, 42" forks, solid tires. Rebuilt-Guaranteed.

Ross Fork Lift Truck, 19 HT, high lift, 6000# capacity, 14' lift, 48" forks. Pneumatic tires. Rebuilt-Guaranteed.

GRINDERS, DISC

Besley 208 Double End 26" x 2¾" wheel with 2 compound tables, V belt drive, 15 HP, 220-440 totally enclosed motor, magnetic starter controls.

2—U. S. Model 80 Double End 2-18" dia. wheels, 7½ HP motor, 2 swinging tables 8" x 14"—1 with hand lever feed.

Besly #372, 53" diameter wheel, 25 HP spindle motor.

GRINDERS, SNAGGING

McCabe 2" x 24" wheels, 48" between wheels, 3/60/440 V.

Ransom 8B Double End 2" x 20" wheels, 220 V motor, p/b control.

1—Hammond type 20 WR2—3" x 24" wheel, double end grinder, single speed, 20 HP Louis Allis Squirrel Cage, 220-440 V—1760 rpm motor.

2—Norton Type D, 3" x 24" wheel, 66" between centers, flat belt drive.

GRINDERS, SWING

Fox 10 HP 3/60/220 V Swing Frame, 2 speed.

U. S. 15 HP, 3/60/440 V Swing Frame, 2 speed.

Fox 15 HP Swing Frame, 2 speed.

Marschke 20 HP, 2 speed.

HOISTS

500# American LoHed.

1000# Cleveland 220/440 V.

1000# Detroit 220/440 V.

5—1000# P & H Hevi Duty with trolley.

2—2000# P & H Hevi Duty with trolley.

2000# Detroit Electric.

2000# American LoHed.

11—4000# P & H Hevi Duty with trolley.

2—4000# P & H Hevi Duty with trolley and powered drive unit for moving hot metal.

2—5 Ton Air Hoists with motor driven trolleys.

LADLES

1 Ton Enclosed Gear Crane Ladle truck type, 4 wheel car for 18" gage track, Whiting Junior.

1—20½" Top Whiting Enclosed Gear Ladle.

MOLDING MACHINES

2—Champion Pin Lift Pushoffs, 46" x 46" x 12" draw.

1—Champion Hand ram, hand clamp, hand rollovers 26" x 14" table.

1—Champion Hand Ram, Hand rollover, Hand draw core machines, 15 x 15 bed.

3—Davenport Portable Jolt Rollover Pattern Draw 20" x 24" tables, open end, 8" draw.

1—International Type G 24 x 10 Jolt Rollover, foot draw, 22 x 30 table, 10" draw.

1—Herman Molding Machine Jolt Rollover Pattern Draw, 20 x 30.

1—Herman Molding Machine Jolt Rollover Pattern Draw, 20 x 36.

1—International Type G 30 x 12 Jolt Rollover Foot Draw, 28" x 36" table, 12" draw.

1—International Type G 30" x 30" table, 9" draw, Portable.

2—International Type G 18" x 56" table, 8" draw. Portable.

1—International Type F Jolt Rollover 27 x 12, 12" draw, 35" x 26" table.

1—International Jolt Rollover Pattern 10" Draw, 22" x 30" plate, 6" jolt cylinder.

1—International Plain Jolt Molding Machine 48" x 60" table, no pit required.

1—Herman Jolt Rollover Pattern draw, 40" x 84" table, slotted nickel alloy table over regular table to accommodate various sized flasks, air clamp, new 1946. Used very little.

1—Herman 20" x 30" rollover pattern draw, 750# series. Air clamp.

2—Herman 20" x 24" Jolt Rollover Pattern Draw, 750# series. Air clamp.

1—Herman 4000# Series High Speed Rollover 30" x 60" with 32" x 48" bumper, 13" cylinder pattern device.

2—Milwaukee Arm Type Jolt Squeeze Strippers, 1500# capacity, Model 163-50 Serial 13104-5, 15" x 24" table, 16" x open end, pattern size. Late type.

1—Osborn 76J Portable Jolt Squeeze Molding Machine 12" cylinder.

3—Osborn Jolt Squeeze Molding Machines, 275J, 16 x 20 table, tilt back head.

2—Osborn 405 Jolt Rollover 40" x 70", 2000# capacity, 20" x 60" jolt table and 4 wheel receiving car.

1—Osborn Portable Jolt Rollover Pattern draw, 900# capacity. Model 601-13. 30" x 24" flask size, 10" draw.

1—Tabor 1000# Rollover, 30" x 60" table.

MULLERS AND MIXERS

Simpson #2 Motor on base, bucket loader.
Simpson #3 Motor on base, bucket loader.
Simpson #3 Type H open gear type.
Simpson #3 Open Gear Type. $1000.00.
American Model M Sand Cutter, 70" blades.
Kwick Mix Paddle Type.
Royer NDP 47 14" Belt, 4 rubber tires.
1—Simpson #1 Style K Muller with Bucket Loader, 4 cu. ft. size.
1—B & P #30 Speed Muller with Bucket Loader.

ROTOBLAST

Pangborn, table with 3-8" rotating work tables, 3 position loading, cleaning and touch-up designed for work similar in size to aircraft cylinders. Like New condition.

SHAKEOUTS

1—3' x 5' Link Belt.
2—4' x 6' Simplicity.

SPEED REDUCERS

Cleveland 408-R1, 36 to 1, 20.5 HP.
Falk Motoreducers 7½ HP.
U. S. Syncrogear Motors 7½ HP.
U. S. Syncrogear Motors 5 HP.

TUMBLING BARRELS

Whiting 30" x 48"

WIRE STRAIGHTENERS

2—Climax 1 HP motor.
1—Kane & Roach 3 HP motor.

ACME EQUIPMENT CO., INC.

WE WILL BUY FOR CASH A SINGLE PIECE OF EQUIPMENT OR YOUR ENTIRE FOUNDRY

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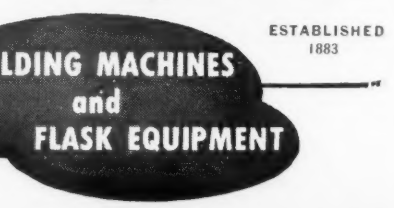
Simple design for reduction of production costs . . . that's what Adams has achieved in their Universal Jolt Squeezer. Used either as a jolt squeeze pattern draw machine, or as a plain jolt squeezer, the operation of these units is so simple that high levels of production can be easily maintained. Available both in post and side rod types, stationary or portable.



Adams custom-built flask equipment

Made by experienced craftsmen, to your exact specifications, Adams aluminum flask equipment gives you superior performance through convenience and economy. Look to Adams Aluminum Easy-off Flasks, Aluminum Upsets and Aluminum Jackets for the finest.

Write for further free information.

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 Foster Street, Dubuque, Iowa, U.S.A.

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Published monthly by

THE PENTON PUBLISHING COMPANY

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Subscription: United States, possessions and Canada, one year $5; two years $8. Other foreign countries, one year, $10. Single copies 75 cents. Copies published three months or more previous to date of current issue, $1.00.

Member: National Business Publications, Inc.; and Society of Business Magazine Editors. Copyright 1954 by THE PENTON PUBLISHING CO.

Entered as second class matter at postoffice at Cleveland, Ohio, under act of March 3, 1879.

FOUNDRY is indexed regularly by Engineering Index Inc.
29 West 39th St., New York 18.

BPA NBP

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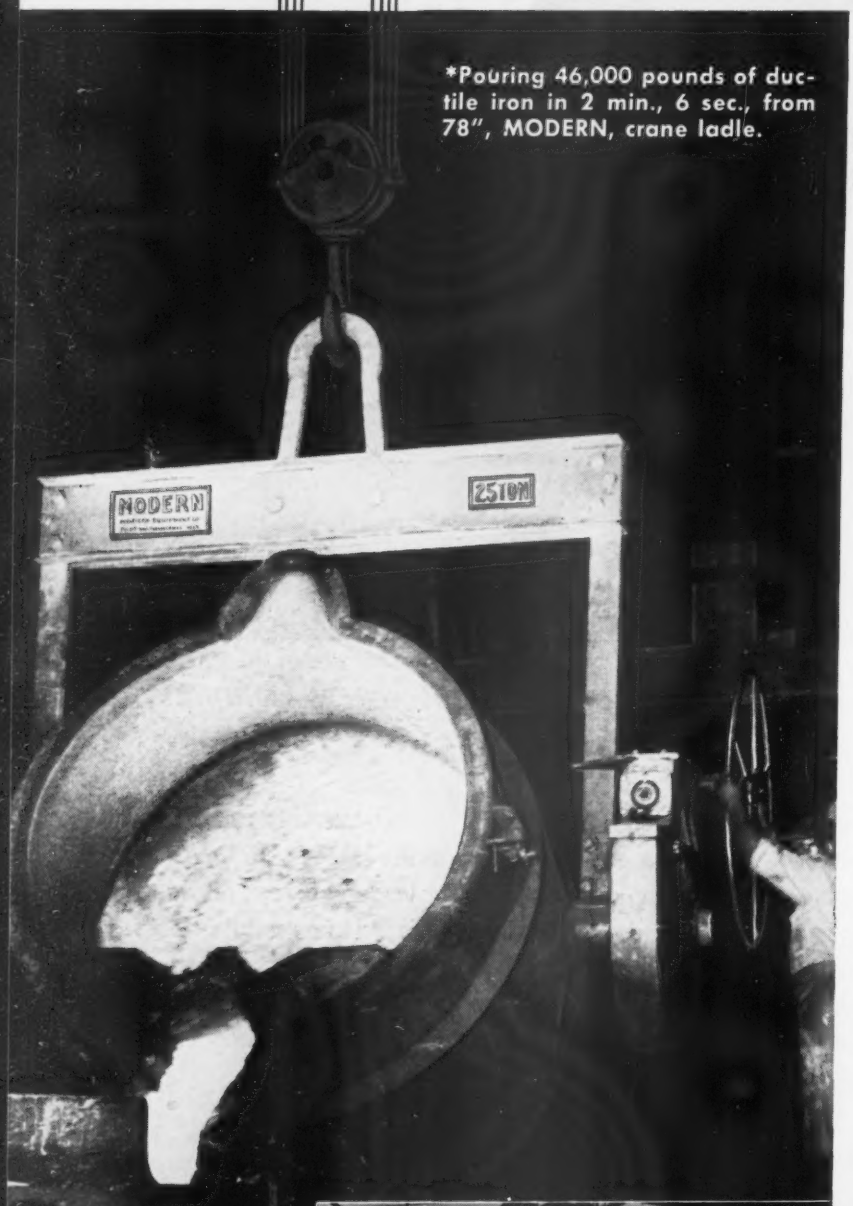

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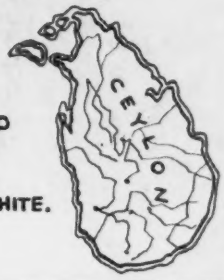

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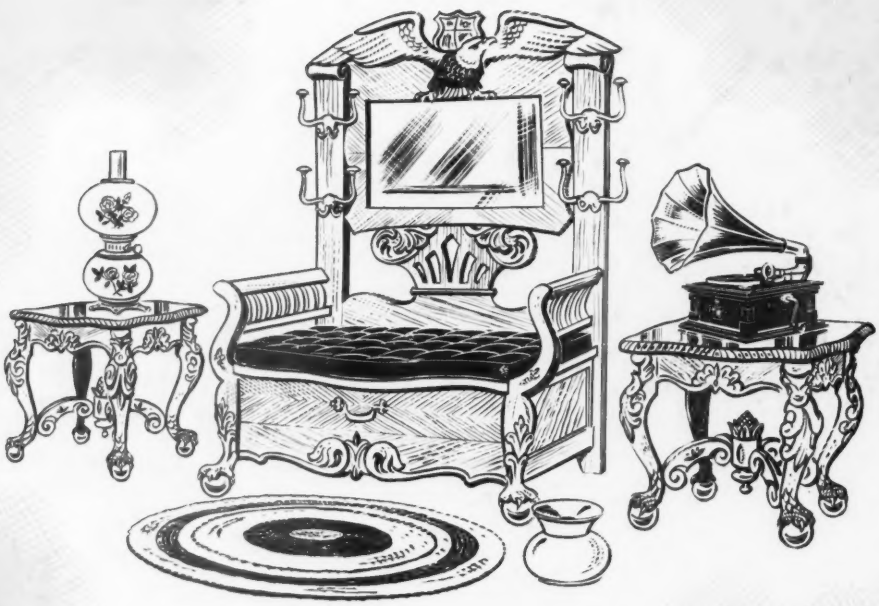

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